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ABSTRACT

National concern has focused increasingly on the need to improve the quality of science and mathematics education in schools in the United States. In response to this concern, four professional associations solicited nominations of exemplary science and mathematics programs. This publication is a compilation of all programs that were nominated. The promising practices include new curricula, teacher training strategies, assessment processes and consortium arrangements. Some practices represent the efforts of an individual teacher in the classroom, while others are district-wide in scope, and may include inservice programs designed to introduce hands-on laboratory experiences in science or problem-solving skills in mathematics. Some represent collaborative efforts between industry and schools or universities and schools to provide teacher training, research, and resources. The 370 practices span kindergarten through twelfth grade. The program descriptions are followed by three indexes: alphabetical, geographical, and subject area. (TW)

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Catalogue of Practices in Science and Mathematics Education

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A Project of COSMOS Corporation in Collaboration with:
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COSMOS CORPORATION

COSMOS Corporation* was founded in 1980 to promote the use of social science knowledge in management and policy settings. COSMOS pursues this objective in a number of unique ways.

First, COSMOS strives to use research to address the ongoing needs of government, university, non-profit, and business organizations. Second, COSMOS stresses the cost-effective application of such research. Third, COSMOS's broad experience with a wide range of agencies and organizations allows it to be highly responsive to the individual needs of clients. Finally, COSMOS is committed, whenever possible or appropriate, to the development of a client's ability to deal independently with future situations.

COSMOS engages in research, training and management assistance, and publication and information dissemination, for which COSMOS is organized into distinct operating units: the Management & Technology Institute, the Small-Business Research Institute, the Case Study Institute, and the Education & Training Institute. Any of the institutes may investigate a variety of substantive topics, including criminal justice, education, housing, neighborhood and economic development, public administration, technology, and transportation, but each institute concentrates on a different aspect of management process or social science investigation.

The **Management & Technology Institute** focuses on management techniques and the interactions among technology, organizations, and social change. The **Small-Business Research Institute** examines the distinctive contributions of small enterprises to the society as well as the public policy implications of their role. The **Case Study Institute** promotes the use of the case study as a research tool. The **Education & Training Institute** performs education research and develops training programs to improve the effectiveness of students, employees, and managers.

This project is one of several within COSMOS's Education & Training Institute

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*Formerly The Case Study Institute, Inc.

Catalogue of Practices in Science and Mathematics Education

Edited by:

J. Lynne White

Judith A. Alamprese
Project Director

COSMOS Corporation

June 1986

A Project of COSMOS Corporation for the National Science Foundation, Grant No. TEI–8550079

PREFACE

This catalogue contains descriptions of all mathematics and science education practices that were nominated by their developers, or others, as exemplary education practices. They are the results of the first year of a search undertaken by COSMOS Corporation and four professional associations--the American Association of School Administrators, the National Association of Secondary School Principals, the National Council of Teachers of Mathematics, and the National Science Teachers Association--to identify promising practices in science and mathematics education.

No effort has been made to screen or assess the practices described in this catalogue, and only minor editing has been done. The intent is to provide a resource document of activities occurring in the field and to increase communication among science and mathematics educators.

The project upon which this catalogue is based was made possible by support from the National Science Foundation (Grant No. TEI-8550079). Dr. Marvin Druger, NSF's Directorate of Science and Engineering Education, serves as project monitor for this grant.

Production of this catalogue has benefitted by assistance from numerous sources. We are grateful to the many individuals around the country who took the time to nominate innovative practices and programs in science and mathematics education. Nearly 370 people responded. As well, the catalogue could not have been completed without the help of two COSMOS staff members, Johanna Lackner and Sharon Clark, who assisted the editor and the project director with the production process.

In spite of this assistance, the editor assumes sole responsibility for any errors or misrepresentations. Publication of descriptions of science and mathematics practices in this catalogue does not reflect the endorsement of the National Science Foundation or the grantees.

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INTRODUCTION

National concern has focused increasingly on the need to improve the quality of science and mathematics education in our schools. Attention has been given to the need for better prepared teachers, different curricula, new instructional methods, and other strategies for reform.

In response to this concern, COSMOS Corporation is conducting a three-year project to identify exemplary science and mathematics practices and to disseminate information about them to school systems across the country. Two criteria make a practice exemplary: 1) that it be at the "cutting edge" of science or mathematics education, and 2) that it have some evidence of effective outcomes. The exemplary practices could be found in laboratories or schools and could include classrooms, school, or district activities. However, all practices must be potentially applicable to public schools at the kindergarten through twelfth grade.

In carrying out this project, COSMOS Corporation is joined by four professional associations: the American Association of School Administrators, the National Association of Secondary School Principals, the National Council of Teachers of Mathematics, and the National Science Teachers Association.

This catalogue is a compilation of all science and mathematics practices and programs that were nominated to COSMOS Corporation and the four collaborating associations. The catalogue is intended to help educators learn about innovations undertaken by educators in mathematics and science education across the country. The practices include new curricula, teacher training strategies, assessment processes, and consortium arrangements, and are located in schools, laboratories, and universities. Some practices represent the efforts of an individual teacher in the classroom, who has an idea for teaching counting or an exciting ecology project for students; others are district-wide inservice programs to introduce hands-on laboratory experiences in science or problem-solving skills in mathematics. Still others are collabora-

tions between industry and schools or universities and schools to provide teacher training, research, and resources. The practices span kindergarten through twelfth grade, with emphasis this first year on the early grades (K-8). Some practices focus on advanced students, others on special education students. Many practices are aimed at teachers of all grade levels.

The process of identifying exemplary practices included several steps. Nominations were solicited from the memberships of the four collaborating professional associations and other educational institutions around the country. The COSMOS project staff, in conjunction with the associations and the project's advisory panel, established specific criteria for effectiveness and innovativeness and reviewed all nominations using these criteria. From the review process, a cross-section of twelve interesting and promising practices were selected. These practices were visited in order to collect information on each practice's implementation and results. Information about the practices will be disseminated by the four participating education associations through their existing newletters, journals, workshops, and national conferences.

The catalogue contains 370 practices, divided into three sections: Mathematics Practices, Science Practices; and Mathematics and Science Practices (practices containing both mathematics and science content). A description of each practice is provided, along with the target population for the practice and the name and address of a person to contact for more information. The practices represent the entire pool of nominations received between November 1985 and January 31, 1986, and, other than those selected for case studies, have not been screened or assessed in any way. In most cases, the exact wording from the nomination forms was maintained in order to preserve the richness and variety of descriptions and to make reading through the catalogue more enjoyable.

Practices are arranged alphabetically by title within each section and each has been given an entry number along the right margin to simplify locating it in the text. The sections are followed by

three indexes: Alphabetical, Geographical, and Subject. The first index is an alphabetical index of all practices by title and entry number. The second is an alphabetical listing of states, showing the entry numbers of practices located in each state. The third one is a subject index, with each practice listed by entry number under several different headings.

Section I

MATHEMATICS PRACTICES

Academic Skills Center Project 1

Phil Lingwood, Program Manager
Denver Public Schools
900 Grant Street
Denver, Colorado 80203

Target Population: Grades 7-12 - Chapter 1 Students

The Academic Skills Center Project is a new Chapter 1 effort that provides computer-assisted-instruction in mathematics and language arts to eligible students. Approximately 1,680 students will benefit from the program in three high schools and three middle schools.

Each center is staffed with a team of three teachers and three paraprofessionals, and utilizes 20 Apple IIe microcomputers to enhance the teaching/learning process. Thirty to forty students are assigned to each center per class period.

The math instruction stresses the importance of analytical thinking in a group setting as well as providing for individualized self-paced learning on computers. As a group, students are taught to understand a problem, devise a plan for solving the problem, execute the plan, and analyze the results. Participants practice computations related to the problems at their own level and at their own pace.

Accelerated Mathematics 2

L. Joy Odom, Secondary Mathematics Coordinator
Department of Academic Skills
Montgomery County Public Schools
850 Hungerford Drive
Rockville, Maryland 20850

Target Population: Grade 7 - Advanced Students

The course is designed around three major categories. The first category is the completion of the K-8 skill objectives. This is completed from a problem-solving standpoint. Category two consists of enhanced units building processes needed for higher level mathematics. Category three is an introduction to algebra through linear functions.

Resources for the course: MCPS's Instructional System in Mathematics (ISM) objectives and problem-solving units; an Accelerated Math 7 text written in MCPS; and Pre-Algebra texts. Length of course is one year.

Activity-Oriented Continuous Progress Curriculum with Comprehensive Criterion-Referenced Testing Program 3

Bonnie S. Cagan, K-8 Mathematics Coordinator
Horry County School District
1701 Horry Street
Conway, South Carolina 29526

Target Population: Grades K-8

This practice was initiated with district-wide, school-level support in 1978. Revised Curriculum Guide 1982 correlated to South Carolina Basic Skills Assessment Program (BSAP). BSAP comprises approximately 66 percent of the total curriculum. The goals are to provide continuous progress through continuous assessment and to afford each student the optimum program consistent with the NCTM/NCSM "Agenda for Action" philosophy. Individual Student Profiles are generated through an initial Placement Survey as well as a yearly Deficiency Survey. Each small objective is assessed through an Evaluation and longer-term memory by a Criterion-Referenced Strand Test. Commercial manipulatives like Powers of Ten, Cuisenaire Rods, measurement tools, etc., and teacher-mades are available to implement concrete activities.

Advanced Eighth Grade Mathematics 4

Marc Hacck, Principal
Hudson High School
136 South Washington
Hudson, Iowa 50643

Target Population: Grade 8 - Advanced Students

This is the first year of this advanced eighth grade course. It includes advanced work in numbers and numeration; number theory; measurement; ration and proportion; percent; solid, transformational, and coordinate geometry; trigonometry; probability; statistics; logic; set theory; topology; functions and relations; historical math topics; LOGO and BASIC programming; and consumer math topics. The goal is to refresh and expand students' knowledge of math skills in preparation for higher math, without providing an eighth grade algebra approach.

Advanced Eighth Grade Mathematics 5

Suzanne L. Simpson, Mathematics Teacher
Fort Campbell North Middle School
Forrest and Gorgas Avenue
Fort Campbell, Kentucky 42223

Target Population: Grade 8 - Advanced Students

This math curriculum is designed to accelerate and enrich mathematics for talented math students. Topics have been chosen to broaden and expand the math curriculum and allow in-depth study or introduce relevant topics not usually covered in middle school. Techniques include discovery, experimentation, and inductive reasoning. Students are involved in preparing lessons or problems and presenting them to the class. Calculators and computers are used when computation would slow experimentation. All materials are teacher-selected from various sources or teacher-written. The materials cover statistics, number theory, set theory, logic, operations and properties of real numbers, equations and inequalities, geometry, proportion and percent, exponents and roots, measurement, probability, and systems of equations. This is a full year study.

Advanced Instruction for Gifted Students 6

Charles Slock, Principal
Rib Mountain School
2701 Robin Lane
Wausau, Wisconsin 54401

Target Population: Grades 5-6 - Gifted Students

Students who are deemed gifted (top five percent) in math are moved through the school district math curriculum. In order to continue the vertical acceleration at the upper grade levels, when we have gone beyond the expertise of our K-6 teachers, we have developed a collaborative effort. Advanced math students at a neighboring university (University of Wisconsin, Marathon Center) are employed to instruct gifted students at our school. The curriculum is determined by our school district math specialist.

Advanced Sixth Grade Mathematics 7

Reta S. Smith, Mathematics Curriculum Supervisor
Springfield Public Schools
940 North Jefferson
Springfield, Missouri 65802

Target Population: Grade 6 - Advanced Students

The goal is to prepare talented sixth grade students to use the problem-solving techniques necessary to be successful in advanced mathematics courses. Selection of students is based on achievement scores, task commitment, and creative thinking in problem-solving. Methods of instruction are grouping within a building for larger group instruction or small group instruction within a classroom. Materials used are McGraw-Hill Math Olympics Handbook (activities developed by sixth grade teachers), Advanced Sixth Grade Math Curriculum Guide, and appropriate problem-solving materials. Communication with parents includes notification that their child has been selected for the program and suggestions for helping students with homework. This program was piloted in five elementary schools during 1983-84. The 1984-85 school year was the first year for a city-wide program.

Algebra Readiness Assessment 8

Scott Brown, Mathematics Department Chairperson
Cody Public Schools
919 Cody Avenue
Cody, Wyoming 82414

Target Population: Grades 8-9

School District No. 6 is presently pretesting eighth and ninth grade students in "Algebra Readiness." This assessment is an attempt to determine the level of thinking of students with respect to a number of mathematics concepts necessary for successful completion of algebra at more than a memory level. The items used are based on the cognitive levels of Jean Piaget and are designed to measure students' mathematical thinking skills relative to concrete and formal reasoning. The assessment device was developed by Judy Olsen, Scott Brown, and Melfried Olson.

Annual Taylor Day at Lakeview Christian School 9

William A. Ewbank, Mathematics Education Associate Professor
Taylor University
Upland, Indiana 46989

Target Population: Grades K-11
Elementary and Secondary Teachers

In 1980, Professor Ewbank approached the principal of Lakeview Christian School offering to take over the whole school--lock, stock, and barrel--teaching all subjects, including music, art, and P.E., and handling all discipline, recess duties, and administrative chores of the day. The school then comprised preschool and K-5. This endeavor was judged a success. The day has been repeated each year with increasing involvement by secondary math education students to teach the junior high and senior high classes (the school now goes through eleventh grade). In 1983, a similar operation was carried out, over two days, with 23 classes at Heritage Christian School, Indianapolis. This time Professor Ewbank conducted all-day inservice workshops in mathematics for the school's teachers, all on a no-cost basis.

Apache Junction Junior High Math Program 10

Carol Hill, K-12 Curriculum Director
Apache Junction Unified School District
P.O. Box 879
Apache Junction, Arizona 85217-0879

Target Population: Grades 7-8

The goal of this practice is math education. It consists of seven semester-long classes. The students are entered by pretest and must show 80 percent proficiency to pass on to the next class. This practice has been in use for eight years. The materials used are teacher-authorized tests (workbooks).

Applied Academics - Mathematics 11

Donella Hess, Applied Academics Coordinator
Cincinnati Public Schools
230 East Ninth Street
Cincinnati, Ohio 45202

Target Population: Grades 11-12 - Vocational Students

The major premise of this program is as follows: instruction in mathematics is more effective if it is related to vocational content and is given either immediately before or at the same time as that content is taught by the vocational teacher. Four applied mathematics teachers throughout the city integrate mathematics with carpentry, auto mechanics, and/or construction electricity to give vocational students credit in Applied Mathematics I or II. The program piloted math during one school year and is now funded by the state as a regular vocational program.

Barrett's Learning Dynamics System 12

Perletter Wright, Mathematics Coordinator
Theodore Roosevelt Elementary School
Underhill Avenue
Roosevelt, New York 11550

Target Population: Grades K-6

Barrett's goals are to achieve high performance in the area of computational skills in arithmetic and then use the basic foundations of the students to further them along in the higher areas of mathematics such as algebra, trigonometry, etc. Interwoven in his program are basic problem-solving skills and understanding of math concepts.

The teacher and student are the basic human resources for the program. He does have videotapes and his own books that are being used in the New York area. Books have been in use about five to eight years, tapes one year.

Basic Skills Math Instruction 13

R. John Paskey, Principal
Lounsberry Hollow Middle School
P.O. Box 219, Sammis Road
Vernon, New Jersey 07462

Target Population: Grades 5-8

Basic skills students (those in need of remedial instruction) utilize a computer lab session to fulfill all requirements of their basic skills individual improvement plan. Computers are utilized in a drill-and-practice style on a daily basis with sequential progress easily measured by the computer.

Bauer and Kids Plant Busters 14

Inez Bauer, Third Grade Teacher
Simmons Elementary School
1500 South 3rd Street
Aberdeen, South Dakota 57401

Target Population: Grade 3

In late September, the third grade class of 30 math students formed a company to grow and sell plants. Each child could buy shares at ten cents per share (maximum three shares). The money was used to purchase plastic cups (for planters) and soil. Plant starts were donated by parents and a local greenhouse. The students tended several plants each for two months and the plants were sold one week before Christmas vacation. Each plant was numbered and had a chart to indicate when it was watered and its weekly growth.

The children learned to chart and measure. They counted money and reviewed addition and subtraction of money facts. Multiplication and division were introduced, and the charts are being kept to introduce graphing later in the year.

Benchmark Testing Program 15

Edward L. Gilbreath, Mathematics Department Chairperson
Fremont Public Schools
130 East Ninth Street
Fremont, Nebraska 68025

Target Population: Grades 3-12

The Fremont Public Schools developed a Mathematics Testing Program to help improve test scores on the California Achievement Test at grades 3, 5, 8, and 10. The staff identified skills that should be possessed by all students at these grades. The skills were correlated with the CAT test and it was found that many of the skills were not measured by the test. The staff decided to design four separate tests at grades 3, 5, 8, and 10 to measure the skills not tested by the CAT. The four tests were checked for validity and reliability by the California Testing Service. The staff developed remediation materials for students that failed to pass the basic skill areas. We have been using the tests and remediation materials for four years. We have started using an NCS scanner, an IBM PC, and the MIMS test scoring program from CTB McGraw-Hill to scan and score all the tests.

Benchmark Tests/Intervention/Promotional Gates 16

Ross Taylor, Mathematics Consultant
Minneapolis Public Schools
807 N.E. Broadway
Minneapolis, Minnesota 55413

Target Population: Grades K-12

Criterion-referenced tests keyed to Minneapolis Public Schools' objectives for grades K-8 and senior high school have been developed. These benchmark tests are given at each grade level, K-9, each spring. Eighty intervention teachers provide intervention in reading, writing, and mathematics for students who do not achieve up to expectations on the benchmark tests. Students in grades K, 2, 5, and 7 who do not achieve satisfactorily are retained and enrolled in special retention programs. Senior high school students who have not passed the tests by the end of the ninth grade receive instruction in specialized programs.

Business and Mathematics Program 17

Mary Ann Weathers, Secondary Education Director
Shelby City Schools
315 Patton Drive
Shelby, North Carolina 28150

Target Population: Grade 8

Above average eighth grade math students are given reinforcement for developing problem-solving skills, techniques, and strategies through this program of on-site observations and in-class visitations by professionals representing several local industries. Problem-solving as related to a wide range of industrial applications (R&D, interpersonal relations, production maintenance, and environmental protection) are observed by students on field trips to PPG, Union Carbide, and Doran Industries. The program is highly person-oriented and requires no special materials and/or equipment.

Business Partners Computer Programming Project 18

Marita Eng, Mathematics Department Chairperson
Sandalwood Junior-Senior High School
2750 John Prom Boulevard
Jacksonville, Florida 32216

Target Population: Grades 10-12

In the fall of 1980, the Jacksonville Chamber of Commerce and the Duval County School System initiated a "Business Partners" program through which local businesses joined in partnership with secondary schools in an effort to create closer understanding and cooperation between the two communities. Sandalwood became partners with Prudential Insurance Company and a joint project in computer programming was developed. The skills and concepts for programming were completed at Sandalwood, but Prudential provided the much needed computer facilities and computer time. Students met weekly in the evenings to use the facilities.

California Mathematics Curriculum Implementation Center 19

Karen Morelli, Director
Alameda/Contra Costa County Offices of Education
313 West Winton Avenue
Hayward, California 94544-1198

Target Population: K-8 Mathematics Teachers

The California Math Curriculum Implementation Center (CIC) is responsible for designing a math staff development program for K-8 teachers throughout California that will impact meaningful change consistent with what math educators are advocating nationally. The project includes: 1) a five-day inservice designed to help teachers teach math more effectively while increasing their own knowledge and understanding of mathematics; 2) extensive follow-up and coaching while teachers are implementing the inservice ideas in their classrooms; and 3) Leadership Training of a statewide network of math staff developers who will provide ongoing on-site support.

Centimeter Santa 20

Rose Kraft, Mathematics Teacher
Roncalli Middle and Junior High School
505 3rd Avenue, S.E.
Aberdeen, South Dakota 57401

Target Population: Grade 6

I purchased a manufactured Santa and placed him in the front of the class. I asked the class to number from one to ten. I then proceeded to ask estimate measurements in centimeters of various parts of his body and clothes (not using rulers). This was done as an introduction to the metric system and measuring. That is all they did with this project the first day. The next two days, they used rulers, white construction paper, glue, and tape to draw their Santas according to their measurements. When they finished drawing, they colored and cut out their Santas for display.

Cleveland Mathematics Teachers Resource Center 21

Harriet A. Jakob, Assistant Coordinator
The Cleveland Collaborative for Mathematics Education
Cleveland Public Schools
1400 Hanna Building
Cleveland, Ohio 44115

Target Population: Secondary Mathematics Teachers

The CMTRC is a facility that provides CPS secondary school math teachers with opportunities for training, collegiality, and information that enhances their knowledge and expertise as teachers. There are a variety of activities planned to implement the three-fold objective (training, promoting collegiality, information dissemination) of the CMTRC. The CMTRC opened October 1, 1985 and is open after school Monday through Thursday and Saturday morning. The CMTRC contains over $4,000 worth of mathematics materials and mathematics education publications, three computers (Apple, IBM, Commodore), public domain mathematics software, and free materials for teachers from business, industry, and textbook publishers. The CMTRC is managed by three CPS secondary school mathematics teachers, and a calendar of the CMTRC's activities is mailed monthly to all CPS secondary school mathematics teachers.

Cognition in Basic Mathematics 22

Jack Lochhead, Assistant Dean of Natural Sciences and Mathematics
University of Massachusetts - Amherst
Department of Physics, Hasbrouck Laboratory
Amherst, Massachusetts 01003

Target Population: College Students

Cognitive Math is a program for college freshmen that teaches mathematical reasoning to students who have previously had difficulty with mathematics. The project consists of two courses: Math 010 and Math 011. Both courses are based on the constructivist view of learning which assumes meaningful learning can only take place when the learner actively constructs concepts and relations. In this regard, expository forms of teaching that "tell" students fundamental rules and concepts are discouraged.

Math 010 is designed for students who need a complete review of mathematics. Primary emphasis is placed on the development of strategies for learning and conceptualizing mathematical ideas. Throughout Math 010, students work together in pairs or small groups to learn skills that should have been learned in elementary school (e.g., fractions, mathematical operations, simple algebra). Math 011 is the second semester continuation of Math 010.

Community Speakers in Mathematics Classes 23

Beth Millbourn, Mathematics Teacher
Porter Junior High School
1030 Cutter Street
Cincinnati, Ohio 45203

Target Population: Grades 7-12

The general goal of my speaker project was to bring mathematics to life by directly relating specific mathematics skills to the speaker's field of work. I met with each speaker twice. The first meeting was to establish the topics to be covered and the materials needed to prepare for the presentation. The second meeting was used as a polishing session to look over the materials and the presentation that the speaker and myself had come up with. The students always had handouts which were used to keep them involved. The information related to the topic was recorded and turned in at the end of the session. This kept the students alert. The speakers were also advised to pose questions rather than just giving information away to elicit involvement. Students often used calculators, so that even students slow in computation could come up with the answers. The overhead with transparencies identical to their handouts were also used for illustration.

Comprehensive Instructional Management System - Math (CIMS) 24

Lawrence Kiley, Superintendent
Union Springs Central School
27 North Cayuga Street
Union Springs, New York 13160

Target Population: Grades K-6

The Comprehensive Instructional Management System (CIMS) addresses district concerns for improving student performance in math, appropriate use of criterion tests results in instructional decisions, structuring the math curriculum to monitor student performance, and providing appropriate staff inservice. In use for the past four years with a consortium of central NYS districts and regional BOCES, the program provides K-6 grade level objectives, pre-post survey tests, objective-based module CRT's, computer scoring and generated data for teacher and supervisor use, materials for student use, and activities for staff development through regional CIMS Coordinators and building teacher representatives.

Comprehensive School Mathematics - Harper-Row Text Program 25

Karen Burk, Reading Specialist
Detroit Country Day School
3600 Broadway Boulevard
Birmingham, Michigan 48010

Target Population: Grades K-2

Since 1980, our school has been trying to upgrade the mathematics program for our early elementary children. Last year we piloted the CSMP and dovetailed this with the 1985 Harper-Row text in first grade only. This year we have expanded the program to include kindergarten and second grade. Next year our target group will also include third grade. Our goal has been to increase problem-solving and the understanding of numbers.

Comprehensive School Mathematics Program (CSMP) 26

John Van Beynen, CSMP Coordinator
Mathematics/Computer Science Department
Northern Michigan University
Marquette, Michigan 49855

Target Population: Grades K-6

The goal of CSMP at St. Michael's School is to continuously have the students involved with the higher level cognitive thinking skills. After the concepts are introduced, they are reinforced and expanded upon weekly and continuously used as tools for the duration of the program. Estimation, mental arithmetic, relational thinking, fractions, decimals, negative numbers, and problem-solving are strong parts of the program. St. Michael's has used the program (K-6) for the past twelve years. The core subjects are departmentalized in grades 4-6.

Comprehensive School Mathematics Program (CSMP) 27

Chuck Lamb, Gifted Consultant
Rockford District 205 - Gifted Program
Muldoon Center
121 South Stanley Street
Rockford, Illinois 61102

Target Population: Grades 1-6 - Gifted Students

In the fall of 1984, the Elementary Gifted Program began teaching the CSMP Math in second and third grades. The following fall of 1985, we added fourth grade. Our goal for 1986 is to add first and fifth grades and in 1987, sixth grade. The CSMP has many well developed workbooks and activities.

Comprehensive School Mathematics Program (CSMP) 28

Carmen Grandy, CSMP Coordinator
St. Joseph Public Schools
2214 South State Street
St. Joseph, Michigan 49085

Target Population: Grades K-3

CSMP is designed as a nonverbal spiral curriculum. St. Joseph Public Schools began to use this curriculum at the beginning of the present school year. The adoption of the curriculum is for our K-3 students. The curriculum is designed for whole class participation but can be adapted for an individual or small group situation. The nonverbal languages of strings, arrows, and the Papy Minicomputer determine the materials necessary for the student to use. The curriculum is designed as basically a consumable materials program.

Computer Assisted Instruction Math Program to Improve Texas Assessment of Basic Skills 29

Billy Welkener, Superintendent
Austwell-Tivoli Independent School District
P.O. Drawer B
Tivoli, Texas 77990

Target Population: Grades 2-8

Implementation consisted of selecting Apple IIe computer hardware and software and of training teachers in the utilization of the computer as an instructional tool. The plan called for increasing the mastery of math objectives by ten percent at each grade level tested, with the intent of having an 85 percent mastery level on all math objectives by the ninth grade.

Computer Assisted Instruction Networking 30

Peggy McDowell, Computer Coordinator
Sunrise Middle School
1750 N.E. 14th Street
Fort Lauderdale, Florida 33304

Target Population: Grades 6-8

The Sunrise Middle School CAI lab is a pilot project that has been operational since September 1985. The school's software is housed on a 45 mg hard disk drive and networked to 15 Apple computers. The software used is provided by Computer Networking Specialists and Ideal Learning Corporation. The goals of the program are to enable teachers to integrate computer-assisted-instruction into the curriculum and to monitor students' progress on the computerized lessons.

Computer Assisted Instructional Management 31

Thomas D. Bishop, Project Developer
Arkansas State University
Mathematics Department, Box 70
State University, Arkansas 72467

Target Population: Grades 3-8

Computer Assisted Instructional Management is a comprehensive software package designed to utilize the potential of microcomputer technology in assisting educators in the management of classroom instruction. It has report generating capabilities that afford the user varied access into student data, either on an individual or group basis, and avoids many of the problems that make most management programs cumbersome to use. The C-AIM system, while technically complex, is easily operated by someone experienced with microcomputers as well as by the first time user.

C-AIM assists the teacher in developing and maintaining a continuous diagnostic record of skill development by students, determining strengths and weaknesses by objectives mastered and not mastered and allows immediate access to this information.

Computer Assisted Management System in Math 32

Sheldon Dumain, Assistant Superintendent
Mineola Union Free School District
200 Emory Road
Mineola, New York 11501

Target Population: Grades 2-6
Grades 7-10 - Remedial Students

For the past ten years, youngsters have been tested, using this system with a pre- and post diagnostic and six trend tests. Analysis of these results provided to teachers and parents have formed the base for teaching appropriate objectives for individuals and small groups of students.

Computer Education 33

Marilyn Silverman, Principal
Roslyn Junior High School
Locust Lane
Roslyn Heights, New York 11577

Target Population: Grades 7-8

Schools have had to define computer literacy as it fits their educational goals, personnel, and budget. We have made maximum use of all three in defining it as the exposure to computers in all subject areas. In addition to extensive use by special education classes, all students visit our computer lab as part of their science, social studies, foreign language, and music curriculums. They work with 12 Apple II+ machines (two printers) for a period ranging from two days to three weeks. Each math class studies a three week computer unit in both grades 7 and 8.

Computer Literacy 34

Betty D. White, Elementary Programs Supervisor
Duval County Public Schools
1701 Prudential Drive
Jacksonville, Florida 32207

Target Population: Grades K-6

Over a three year period, starting in 1983, the Duval County Public Schools Computer Literacy curriculum has been implemented in 97 elementary schools. The curriculum provides opportunities for all students in grades K-6 to understand the capabilities, applications, and social implications of computer technology. A computer lab of 15 computers and a network has been installed in 93 of the 97 elementary schools. Each student participates in classroom appropriate computer literacy as well as at least nine hours per year of computer hands-on experience.

Computer Managed Instruction Program in Mathematics 35

P.C. Christensen, Principal
Stayton Middle School
1021 Shaff Road
Stayton, Oregon 97383

Target Population: Grades 5-8

Our district has developed and implemented a Computer Managed Instruction Program in mathematics to increase student achievement. Our goal is for each student in each grade to master all mathematics skills for that grade (about 60 goals per grade). We have identified a set of math skills to be mastered in each grade level, using a local education consortium (Valley Education Consortium) skills list as the skeleton. We aligned our instruction with this set of skills. Teachers teach the skills using their regular textbook. Students are tested on a skills test (five items per skill) at the completion of each chapter/unit. The tests are scored by a card reader and the data is compiled in a computer. Printouts of the test results give the teacher individual and class feedback on skills mastered by each student (80 percent set as mastery level). The teacher uses the data on each student's mastery or non-mastery of skills to plan for additional re-teaching. Students review and retest periodically to determine if some skills need to be re-taught by teachers.

Computer Mathematics Program 36

Linda Lanterman, Seventh Grade Teacher
Glen Meadow School
P.O. Box 516
Vernon, New Jersey 07462

Target Population: Grade 7

Once a week each student is involved in a computer lab. During this period, students not only learn how to operate a computer, but complete many math problems as well. Along with computer workbooks and math cassette tapes, the children also use exercises from the Scott Foresman math series.

Computerized Elementary Mathematics Program 37

Leslie Imprata, Curriculum Coordinator
Cranston Public Schools
845 Park Avenue
Cranston, Rhode Island 02910

Target Population: Grades 1-6

Over the past three years, classroom teachers developed a new elementary math curriculum for grades K-6 that was piloted in 1984-85 and implemented in 1985-86. Its components include: a computerized testing program originally designed by the teachers; a standardized format throughout each school utilizing criterion-referenced data based on mastery learning; "essential" skills designed to meet the needs of individual students, as well as enrichment activities for the advanced learner; current inservice training coordinated by teachers for teachers; and all data in a curriculum guide.

Computerized Instructional Management System 38

Ross Taylor, Mathematics Consultant
Minneapolis Public Schools
807 N.E. Broadway
Minneapolis, Minnesota 55413

Target Population: Grades 3-6

Eleven schools are currently using the Computerized IMS Plus Instructional Management System in mathematics and reading. Use of this system enables teachers to systematically focus instruction on Minneapolis Public Schools' objectives. Each of the 11 schools has an IBM/AT Computer, Sentry 3000 Scanner, and Okidata Printer. A 20-hour weekly Management Information System Assistant is provided in each school to operate the program. Within the next two years, we expect to extend the program to all Minneapolis schools and to all grades 2-12.

Concentrated Math Skills (CMS) 39

Anna Grosgalvis, Chapter 1 Supervisor
Milwaukee Public Schools
P.O. Drawer 10K, 5225 West Vliet Street
Milwaukee, Wisconsin 53201-8210

Target Population: Grades 6-12 - "At Risk" Students

Concentrated Math Skills (CMS) program is characterized by the systematic use of active learning/teaching strategies based on neurological principles. The goal is more learning for the time spent so that "at risk" students have a chance of "catching up." The use of specific activities is determined by the optimum frequency, intensity, and duration which will accelerate the pace of learning. Underlying facts and the "tool" skills in math are honed to a level of automaticity that frees students to think about problem-solving and applications. The dynamic, interactive use of computers as instructional tools has been integrated into this nine year old program in the last two years.

Concept Based Two-Year Non-Algebra Sequence for Students in the Senior High School 40

Cile Chavez, Deputy Superintendent
Littleton Public Schools
5776 South Crocker Street
Littleton, Colorado 80120

Target Population: Grades 10-12

The goals are to provide a meaningful alternative to students not yet ready to succeed with algebra; to provide the experience base necessary for these students to make the leap to formal thinking thus preparing them for algebra; and to acquaint these students with a wide variety of mathematical topics that are normally not available to them (e.g., probability and statistics, geometry, similarity, spatial relations). Instruction focuses on learning cycles in which concepts are introduced, students explore the concept with concrete manipulatives, the concept is summarized, and the concept is applied. Instruction requires students to be actively involved on a regular basis. Instruction begins with concrete representations of the concept being explored. Equipment includes calculators, computers, pattern blocks, fraction bars, equal arm balance, cuisenaire rods, and many other standard and not so standard mathematical manipulatives.

Contest Quiz 41

Ernie Kruse, Mathematics Teacher
Langford Public Schools
Langford, South Dakota 57454

Target Population: Grades 8-12

I teach using a topic, concept, method approach. I expect (require) my students to take notes. These notes should allow them to understand and work problems both now and any time in the future by following the step-by-step procedure listed in the method.

To promote both the taking and the daily use of notes and also to create enthusiasm for learning and doing well, I give both announced and unannounced "contest quizzes." Format: 1) we divide into teams of three or four or five students by drawing cards; 2) we take a quiz over recent material; and 3) "bonus" points are given in various categories. Usually, the categories are each member of the winning team, half the second place team, and hi-scorer with non-previous points. They usually get two bonus points. The bonus points are added on to the test score when the test is taken over the material covered by the contest quiz. For example, a student might score 88 percent on the test and if he has four bonus points accumulated then his official score will be 92 percent.

Continuous Progress in Mathematics 42

Caron Cooper, Continuous Progress Monitor
Monroe Middle School
2800 Bailey Lane
Eugene, Oregon 97401

Target Population: Grades 6-8

At Monroe Middle School, our 500 students are placed in mathematics classes at their skill level so they can make individual continuous progress through our district's mathematics skill sequence. We have 13 different math classes that provide five levels of skill instruction: remedial, corrective, regular, accelerated, and advanced. Our incoming sixth graders are placed based on elementary teacher recommendations and test scores. Once enrolled, a student's performance is closely monitored by the math teachers. Students may be moved to a higher or lower class at any time during a term. The placement and progress of the students is coordinated by the continuous progress monitor who also coordinates testing, curriculum, material, inservice, and record keeping. A half-time aide is assigned to assist the continuous progress monitor with record keeping and testing.

Copperas Cove Mathematics Program 43

Jack Ayres, Assistant Superintendent
Copperas Cove Independent School District
P.O. Box 580
Copperas Cove, Texas 76522

Target Population: Grades K-8

The goal of the Copperas Cove Mathematics Program is to instruct each student in grades K-8 to a mastery level as determined by state and local standards. The methodology includes first and foremost the philosophy and process of Mastery Learning. The philosophy being that "all children can learn" and engaging them in a learning cycle of Teach, Test, Reteach, Retest. Materials include locally-developed curriculum guides and state-adopted materials, as well as tactile and concrete instructional aids. The practice is in its third year of implementation.

Counting On for Addition Facts 44

Karen Fuson, Associate Professor
University of Chicago School Mathematics Project/ Evanston Public Schools
Northwestern University, School of Education
Evanston, Illinois 60201

Target Population: Grades K-2

First grade children of all ability levels have for two years successfully been taught to solve the more difficult single-digit sums (sums between 10 and 18) by counting on the smaller number using one-handed finger patterns to keep track of the words counted on. High-ability first graders and all ability levels of second graders are able to use the finger pattern addition to add with regrouping multi-digit numbers of as many as ten places. Thus, teaching of whole number addition can be completed by the end of second grade.

Counting Up for Subtraction Facts **45**

Karen Fuson, Associate Professor
University of Chicago School Mathematics Project/Evanston
Public Schools
Northwestern University, School of Education
Evanston, Illinois 60201

Target Population: Grades K-2

First grade children of all ability levels have for two years successfully been taught to solve the more difficult single-digit subtraction problems (those with minuends between 10 and 18) by counting up from the smaller to the larger number using one-handed finger patterns to keep track of the words counted up. High-ability first graders and average-ability second graders are able to use the finger pattern subtraction to subtract with regrouping multi-digit numbers of as many as ten places. Thus, teaching of whole number subtraction can be completed for many children by the end of second grade.

Course Sequence **46**

Chris P. Christensen, Mathematics Teacher
McLaughlin High School
McLaughlin, South Dakota 57642

Target Population: Grades 9-12

I have changed the sequence for math courses from Algebra I-Geometry-Algebra II-Senior Math to Algebra I-Algebra II-Geometry-Senior Math. The practice out here seems to be to have Geometry as a sophmore class. However, I have changed Geometry to a junior class. This was the sequence in my high school back in Michigan. I feel that putting Algebra I and Algebra II back-to-back helps the students retain the concepts of algebra. Geometry requires a different type of thinking and older students are better able to grasp the concepts in geometry.

Creative Thinking Skills: A Program in Mathematics for the Gifted 47

Mary L. Hilgenberg, Mathematics Coordinator
Heman Street School
Heman Street
East Syracuse, New York 13057

Target Population: Grades K-12 - Gifted Students

The target population is students in grades K-12 who are mathematically talented as defined by the following criteria: quantitative IQ 127+ with strong achievement test scores, and teacher and math diagnosticians recommendation. The program is designed to provide students with: a) basic concept and computational skills development; b) topics of study to increase their problem-solving and visual-spatial thinking skills; and c) topics of study to increase their interest in mathematics. The program uses no special equipment. The teaching materials are those that are available from a variety of vendors. The program began in September 1978 and continues today.

Critical Thinking Resource Materials 48

Mike Walker, Academic Program General Director
Duval County School Board
1701 Prudential Drive
Jacksonville, Florida 32207

Target Population: Grades 7-12

There is definite need for more criticial thinking in mathematics. The teachers in Duval County produced "Critical Thinking Resource Materials" for teachers in seventh grade, Geometry, Algebra I, and Algebra II. These materials were distributed to teachers in August 1985. These materials contain lesson plans, activities, needed material and the evaluation component for each topic area. There were several topics chosen in each subject area so that these topics can be matched to the already defined course objectives. These critical thinking materials go beyond minimums and include standards of excellence.

CSMP Mathematics/Staff Development Project 49

Deborah Ball, Project Leader
East Lansing Public Schools
509 Burcham Drive
East Lansing, Michigan 48823

Target Population: Grades K-5
Elementary Teachers

During the 1985-86 school year, East Lansing teachers are starting to teach using Comprehensive School Mathematics materials. The goal is to broaden and strengthen the mathematics being taught at the elementary level, increasing the emphasis on problem-solving, and thinking mathematically without sacrificing computational accuracy. While the materials provide stimulus and guidance to teachers, we are also providing ongoing staff development. One teacher serves as the leader, organizing group inservice work sessions and working with teachers in their classrooms on an individual basis. The focus of this support help varies, including mathematical content, pedagogy, and general experimentation with teaching and classroom management.

Developmental Approach to Teaching Mathematics 50

Allan B. Chesterton, Curriculum and Instruction Director
Manchester Public Schools
45 North School Street
Manchester, Connecticut 06040

Target Population: Grades K-6

The revised math program K-6 utilizes Piaget's developmental stages of learning. Math topics are organized around four major strands: data analysis, spatial relationships, problem-solving strategies, and number working which includes place value, operations, fractions, decimals, and percent. An activity-based, problem-solving approach is emphasized. Extensive use of manipulatives and concrete approaches to learning math are made at the K-4 levels. Expansion of math instructional time and topics, including estimation, graphing, patterning, problem-solving, geometry and measurement, probability, statistics, calculators, and computers are a part of the content at each level. This revision began during the 1981-82 school year. The main differences occur in the use of manipulatives, the expansion of topics, and the delaying of rote memorization of facts and processes.

Diagnosing Mathematics Deficiencies 51

Dorothy Mack, Mathematics Coordinator
Charleston County Schools
3 Chisolm Street
Charleston, South Carolina 29401

Target Population: Grades K-12 - Chapter I Students

Charleston, S.C. County developed diagnostic tests of prerequisite skills for each of the objectives in its mathematics program (K-12). These tests assist teachers in pinpointing the gap in a student's cognitive development which might be causing him/her to have difficulty in mastering a particular objective.

Diagnostic and Prescriptive Teaching of Mathematics 52

Doris Creswell, Mathematics Education Advisor
Pennsylvania Department of Education
333 Market Street
Harrisburg, Pennsylvania 17126-0333

Target Population: Teachers and Administrators - Grades K-8, Special Education, ECIA, and Chapter I

This practice involves a teacher training course and implementation procedures for administrators. The goals are to train teachers to administer four levels of diagnostic assessment and to prescribe appropriate instructional activities, strategies, and materials based on the assessment. Methods used are discussion, demonstration, hands-on practice with manipulations, and work with children. The materials include a teacher manual with narrative and reproducible diagnostic instruments for three levels (500 pages), five videotapes of program features, and basic manipulations that are commercially produced. The time is 20-30 hours.

Diagnostic Math Clinic 53

Janet K. Scheer, Diagnostic Math Clinic Director
Southern Illinois University at Carbondale
Department of Curriculum, Instruction, and Media
Carbondale, Illinois 62901

Target Population: Grades 2-11

The Diagnostic Math Clinic at SIU-C was established in 1978 to serve three basic purposes: to train teacher/specialists in clinical techniques of diagnosis and remediation; to help individual children overcome their specific learning difficulties; and to develop diagnostic and remedial models and procedures and to further research in this area. The operation of the clinic involves: 1) teacher-clinicians working with appropriate materials, diagnosing (using teacher-made and diagnostic arithmetic achievement tests, cognitive style tests, and profile information tests), and implementing remedial procedures with school children; 2) coordinating these diagnostic/remedial encounters; and 3) providing clinicians (inservice and preservice teachers, consultants, math supervisors, and graduate students) with instruction and experiences in the methods and materials of mathematics diagnosis and remediation.

Dimension in Mathematics 54

Beverly R. Forster, Mathematics Coordinator
Norfolk Public Schools
800 East City Hall Avenue
Norfolk, Virginia 23510

Target Population: Grades K-6

For the past several years, a committee of teachers has been developing and assisting in implementing a new K-6 curriculum for Norfolk Public Schools. While the complete guide is exemplary, the spatial strand is especially good. Topics within the spatial strand have been introduced and recycled constantly from kindergarten through sixth grade as an integral part of the curriculum. The intent is to strengthen visual perception (especially for females) and to establish a firm foundation for geometric concepts and scientific methods such as classification.

Distinctive Sequencing of Courses 55

John Landau, Principal
Monticello Middle School
28th & Hemlock
Longview, Washington 98632

Target Population: Grades 6-8

Sequencing of courses includes: 6th grade--(Placement is done by the 5th grade achievement test results and teacher recommendation) High Regular (top 20 percent), Regular, Basic, and Remedial; 7th grade--(The top "High Regular" students are picked by their 6th grade teachers to form an "Honors Class") High Regular, Regular, Basic, and Remedial; and 8th grade--Honors (a combination of Algebra and Geometry), High Regular (Pre-Algebra), Regular, Basic, and Remedial. There is some cross-grade level grouping. The goal is to group students with similar instructional needs and yet maintain flexibility of movement from class to class. The program relies on communication within the department. There is considerable movement from class to class. As much "back-to-back" scheduling is done to facilitate movement.

Duplation Division and Multiplication 56

Peter A. Simpson, Teacher
St. Pius X High School
2674 Johnson Road, N.E.
Atlanta, Georgia 30345

Target Population: Grade 9

Duplation division and multiplication were designed primarily for the slow-learning or the student who has difficulty remembering the times tables. It was copyrighted in 1978 and 1979, and has been in use in Monroe County, Florida, and now Atlanta. Each elementary education major at University of Florida is introduced to it by Dr. Roy Boldue. It was published in the Mathematics Teacher in November 1978. The original purpose was to teach four seniors at Coral Shores High School in Tavernier, Florida to pass the statewide competency exam. It was presented in two hours and three of the four were successful on the test.

Elementary Mathematics Inservice Program for the Sac and Fox Settlement School 57

Jack D. Wilkinson, Mathematics Professor
University of Northern Iowa
Department of Mathematics and Computer Science
Cedar Falls, Iowa 50614

Target Population: Grades Pre-K-5 - Native American Students

This inservice project will deal primarily with methods of teaching arithmetic and geometry to Native Americans at the Sac and Fox Settlement School in Tama, Iowa. The inservice project will provide workshop experiences for teachers and for teacher aides. Most of the teachers (five out of the seven) are not Native Americans but all five of the aides are Native Americans and all of the students are Native Americans.

The project was funded on November 15, 1985 and is just beginning to get underway. The principal investigator has made two trips to the Settlement School. Our major objective is to develop a management system and model whereby we teach problem-solving skills and processes. A second major objective is to use an activity-rich environment and to emphasize meaningful learning of arithmetic of whole numbers, fractions, and decimals.

Elementary Support Model 58

James J. Sarnecki, Supervisor
Elementary Education Division
Baltimore City Public Schools
1519 Winford Road
Baltimore, Maryland 21239

Target Population: Elementary Teachers

The BCPS had developed a program to insure more effective instruction, to provide a comprehensive skill and concept program, and to increase levels of student achievement as measured by standardized and non-standardized test scores. The components have been put in place over a period of several years and include: 1) a curriculum based upon the grade level expectancies of the Maryland State Department of Education; 2) a timeline, adjusted yearly, which provides all teachers with guidance as to when each portion of the curriculum is to be taught and the length of each unit; 3) an instructional model which pairs teachers in grades 3-6; 4) a proficiency testing program for grades 3-6 in which all items that receive an 85 percent or better score, system-wide, are upgraded based on the curriculum scope and sequence; and 5) deployment of support teachers to insure that the curriculum is being taught in a timely, effective manner with appropriate staff development and monitoring.

Enriched Mathematics for Elementary Gifted and Talented Students 59

Gaynell Gordray, Teacher
Adams Elementary School
2200 East Randolph Street
Enid, Ohio 73701

Target Population: Grades K-4 - Gifted Students

First and second grade enriched class bring empty food boxes, empty canned goods, milk cartons, pizza boxes, etc. for a store. The enriched children play store using calculators to add up the bill and play money to buy food with. This teaches them values of money and also how to count back money. They love pricing and buying.

Exemplary Middle School 60

Joan Nofsinger, Chairperson
Keyser Middle School
Keyser, West Virginia 26726

Target Population: Grades 6-8

There are some exciting things going on within Keyser Middle School and they are even more exciting within the mathematics department. The school is a bright, lively, extremely well-run place and the kids are getting a super mathematics education. In short, in their own adapted, intuitive way, fundamental research conclusions and recommendations are alive and well in the school and help to shed light on the extraordinary success of its math department. For example: Bloom, et al. talk about mastery learning and the school uses a teach-reteach/-enrich model to significantly increase the level of student skill mastery; the school uses much of Frank Lester and Randall Charles' work on effective teaching of problem-solving; the school has adapted a model similar to the Missouri Mathematics Effectiveness Model that incorporates review, clear development, practice, and direct teaching; and the school in general and its math department in particular exude the characteristics that the effective schools movement addresses, such as high time on task, clear sense of mission, and instructional leadership.

Fast Five 61

Sharyl V. Cummings, Mathematics Teacher
Mansfeld Middle School
1300 East Sixth Street
Tucson, Arizona 85719

Target Population: Grades 7-8

The goal is to improve student scores on National Standardized Tests by reducing anxiety. The specific objectives are: 1) to increase student exposure to standardized test format of math problems; 2) to increase student exposure to a variety of unrelated math concepts in short periods of time; 3) to provide review of material previously taught; and 4) to introduce math topics commonly found in the last few chapters of the texts, which are seldom reached in the duration of the school year. The method involves each student, upon entering the classroom, picking up a paper (Fast Five) which has multiple choice questions, works them, then discusses them.

Flashcard Competition 62

Ted Moran, Fifth Grade Teacher
Lounsberry Hollow Middle School
P.O. Box 219, Sammis Road
Vernon, New Jersey 07462

Target Population: Grade 5

Approximately once a month, the two math classes and teachers are involved in "friendly" competition on basic math facts. One student from each class approaches the front of the room, the card is shown by the teacher, the answer is shouted out, and the first correct response results in the winner moving to the end of his class line and the loser being seated. Whichever class has the last student or students standing is the winner of the game. Mr. Caggiano and Mr. Moran have been doing this for four years and have found it to be very successful in many ways.

Funfax Basic Fact Program 63

Carol A. Thornton, Professor
Illinois State University
Mathematics Department, 313 Steven Hall
Normal, Illinois 61761

Target Population: Grades K-3
Grades K-9 - Remedial Students

The goal is number fact mastery to match demands of written and mental computation and estimation. The method involves explicit teacher intervention to teach efficient strategies for deriving unknown facts after concept teaching/review for each operation. Equipment and materials used include: readily available teaching aids; school adopted math text, typically taught out of sequence to allow students to develop strategies for answering unknown facts; and supplementary activities, ideas, and often pupil pages from the Funfax Basic Fact Program. Program has been in use (in its present form) since 1981 in Australia, and in the U.S. since 1983.

Gifted Math Program 64

Betty J. Krist, GMP Co-Director
State University of New York/Buffalo
560 Baldy Hall
Buffalo, New York 14260

Target Population: Grades 7-12 - Gifted Students

The Gifted Math Program provides instruction for 250 secondary students of exceptional math ability (top one percent) from 85 schools in western New York. The complete 7-12 program has been in existence since 1979. Students study twice a week at the university. The program entirely replaces their regular school math program and they obtain both school and university credit for their work as early as the seventh grade.

Hands-On Equations Learning System 65

Henry Borenson, President
Borenson and Associates
1469 Neshaminy Valley Drive
Bensalem, Pennsylvania 19020

Target Population: Grades 3-5

The goal is to have elementary school students gain an understanding and familiarity with algebraic linear equations such as $2x+x+x+2=2x+10$ and $2(x+4)+x=x+16$ (Level I); $2x+(-x)+3=2(-x)+15$ (Level II); and $x-3(x+1)=7+(-x)$ (Level III). The algebraic linear equations are translated into concrete, physical representations and then solved using physical "legal" moves. Student equipment includes: (Level I) eight blue pawns, two red cubes numbered 0-5, two red cubes numbered 5-10, and a paper scale; (Level II) as above, and eight white pawns; and (Level III) as above, and four green numbered cubes. The field testing and development has been over a two-year period.

Have Lesson Will Travel 66

Patrick Brown, Mathematics Coordinator
Vernon Public Schools
Route 30
Vernon, Connecticut 06066

Target Population: Grades K-12

This program consists of a series of four lessons (to be expanded to five) in mathematics. The lessons involve problem-solving and manipulative materials. The lessons are appropriate for various age levels. The major goal is to show teachers, therefore, students some novel ways of presenting concepts.

Honors Math Seminar 67

William Wagner, Mathematics Director
North Shore High School
450 Glen Cove Avenue
Glen Head, New York 11545

Target Population: Grades 9-12

This program is an honors seminar in mathematics. Students are invited to participate. The seminar is conducted once a week, before school with ninth graders attending on Mondays, tenth graders on Tuesday, etc. The seminar program is designed to give the few exceptional students on each grade level an intellectual forum in which to pursue mathematical ideas not generally covered in standard high school curriculum.

Hotline Math 68

Mike Walker, Academic Program General Director
Duval County School Board
1701 Prudential Drive
Jacksonville, Florida 32207

Target Population: Grades K-12

"Hotline Math" is a television homework assistance program in mathematics. This program is broadcasted via the local public broadcasting station one afternoon a week for one hour. The cast attempts to assist a cross section of students' problems to make the program helpful and entertaining to all who watch it. In 1982, the first year of Hotline Math, the program won a national award from the National School Public Relations Association for outstanding use of television for educational purposes.

Improving Inservice Training through Feedback Via Computer 69

C. Dockweiler, Mathematics Education Associate Professor
Texas A&M University
EDCI Department, 308 Harrington Tower
College Station, Texas 77843

Target Population: Teachers

The goal of this study is to add to the effectiveness of inservice teacher training by providing the teachers ready access to trained, professional advice while applying newly acquired skills. This practice allows teachers to conduct continual discussions with both their fellow colleagues and trainers as they attempt to implement better methods of instruction by giving newly trained teachers access to a conferencing network through a highly portable microcomputer 24 hours a day.

Increasing the Use of Math Manipulatives 70

Judith Pusey, Instruction Director
Bangor School Department
73 Harlow Street
Bangor, Maine 04401

Target Population: Grades K-8

During three consecutive summers and the insuing school years, 37 elementary and middle school teachers in the Bangor schools participated in workshops designed to increase the use of concrete manipulative materials in their classrooms. These teachers then developed lists of math manipulatives that should be available and used at each grade and/or building level. The Bangor School Committee supported the staff's efforts by allocating $15.00 per child to be spent on math manipulatives during the 1985-86 school year.

During the 1985-86 school year, workshops have been scheduled for all teachers in every grade level, for administrators, for aides, and for parents to explain the whys and hows behind the use of manipulatives. The core group of teachers has served as a math committee guiding the structure of the grade level and cross-grade level meetings and as peer coaches to facilitate the use of more concrete materials.

Individualized Math Program 71

Willard Hansen, Principal
Jane Addams School - District No. 89
910 Division Street
Melrose Park, Illinois 60160

Target Population: Grades 7-8

Since I was unsuccessful in my search for an individualized math program, I devised one of my own. My aim was to meet the needs of each student in a heterogeneous group. We teach with the Houghton Mifflin materials. After studying these materials, I selected five tests from each unit as criteria for advancement: Review A textbook, Review B textbook, O Teacher's Bonus Book, U Teacher's Edition Unit Test, and T Test Booklet. The teacher hand scores tests A and B, tests O, U, T are scored on the Scan Tron. These test results are graded and entered in the student's individual chart. The teacher keeps an identical chart.

Individualized Mathematics 72

Cecil Armstrong, Principal
Athens Middle School
601 South Clinton Street
Athens, Alabama 35611

Target Population: Grades 6-8 - Advanced Students

At each class period, sixth, seventh, and eighth grade students assemble in one room and each student "does his own thing" at his/her own level. The teacher has some group instruction for subjects with a commonality, such as geometry basics and measurement systems, but otherwise students work at individual assignments, take pre- and post tests, and submit a tabulation of homework or outside work. The teacher has 89 students. It is considered an excellent program.

Inservice Material 73

Richard Dahlke, Mathematics Education Professor
University of Michigan - Dearborn
4901 Evergreen Road
Dearborn, Michigan 48128

Target Population: K-8 Mathematics Teachers

A new book has been written, What Expert Teachers Say About Teaching Mathematics, by Richard Dahlke and Roger Verhey. This book is based on a comprehensive questionnaire and helps preservice and inservice teachers develop effective management plans for teaching mathematics. Practical questions about how to teach are answered by the voices of experience, with insightful responses from more than 50 master teachers. Following each set of teacher responses are exercises that stimulate thought and discussion, involving the reader in these important issues. This book includes an annotated bibliography of selected resources and classroom materials to aid the math teacher.

Inservice Training in Elementary Mathematics Teaching 74

Vanda M. O'Reilly, District Coordinator
New Britain Public Schools
27 Hillside Place
New Britain, Connecticut 06051

Target Population: K-8 Teachers

As an urban school district with a large minority population, New Britain's performance on state and national testing instruments indicated a need to improve our mathematics program. One approach to this goal is a long term staff development project designed to improve mathematics instruction in elementary classrooms. Ten to fourteen hour work sessions are scheduled with teachers in the grades targeted each year. Workshop leaders include math professionals throughout the state. Goals of the project include promotion of the concrete-pictorial-abstract sequence in the teaching of mathematics and infusion of problem-solving into the curriculum. The project is a cooperative effort between mathematics professors at Central Connecticut State University and district personnel and is funded through a State Department of Education Priority Schools grant.

Integration of Language Arts, Reading, and Mathematics (LA RE MA) 75

Bernard R. Yvon, Math Education and Child Development Professor
University of Maine
317 Shibles Hall
Orono, Maine 04469

Target Population: Grades K-8
Elementary Teachers
Elementary Education Majors

LA RE MA is a semester's integration of the content of Language Arts, REading, and MAthematics elementary methods for the following purposes: 1) modeling of team teaching skills for effective math instruction; 2) modeling integration of content in three K-8 curricular areas; 3) collaborative planning and execution of school experiences and course content with area teachers; 4) school experiences, integrated with the demonstration of effective delivery of Language Arts, Reading, and Mathematics content; 5) demonstration to students of the importance of language arts (reading, writing, speaking) as the foundation of all other learning, and especially in this case, mathematics; and 6) integrating and infusing the teaching of math with other school subjects to emphasize practical reality and usefulness in a problem-solving context.

Integration of Problem-Solving within the K-12 Math Course of Study 76

Kathleen Klink, Assistant Superintendent
Lakota Local District
5030 Tylersville Road
West Chester, Ohio 45069

Target Population: Grades K-8

A major goal of the Lakota mathematics graded course of study is problem-solving. Teachers at all grade levels emphasize problem-solving by providing the students with a variety of mathematical experiences that progress from concrete to abstract levels. Textbook materials have been selected that equip the students with specific problem-solving strategies applicable to all areas of mathematics, not just the four basic operations. The program is in its second year of implementation.

Interactive Video to Teach Mathematics 77

C. Sue Phelps, Assistant Superintendent
Whitfield County Schools
Box 2176
Dalton, Georgia 30720

Target Population: Grades 6-12

In conjunction with Tennessee Valley Authority, the school systems are developing a demonstration in the use of interactive video to teach rational numbers. Our long term goal is to use the demonstration to acquire funds to develop lessons which cover basic mathematics as measured by minimum competencies.

Interdisciplinary Computer Project 78

Kim Dilettuso, Middle School Curriculum Leader
Fort Couch Middle School
515 Fort Couch Road
Upper St. Clair, Pennsylvania 15241

Target Population: Grade 8

The interdisciplinary computer project was designed to integrate the use of the computer with the four analytic disciplines at the eighth level. This approach is far more useful than associating the computer with mathematics only. Prior to implementation of the project, students work on keyboard skills in small groups, using both computers and typewriters. During the first weeks of the project, content-related software is introduced correlating with curriculum objectives. Language arts objectives deal with drawing conclusions, inferences, and composition skills. In mathematics, activities demonstrate order of operations, fractions, radicals and radical equations, and the quadratic formula. The objective of the third phase of the project is to instruct the student in the usage of the Bank Street Writer word processor. Using the tutorial disk for the Bank Street Writer and teacher-made worksheets, different lessons are taught. Finally, the last phase of the project is the application of the Bank Street Writer. One of the language arts objectives is given as a word-processing assignment.

Junior High/Middle School Math Bowl 79

John Watts, Teacher/Contest Director
Kentucky Council of Teachers of Mathematics
P.O. Box 22
Richmond, Kentucky 40475

Target Population: Grades 6-8

KCTM sponsors a statewide contest called the Math Bowl. The state is divided into regions. Teams from local schools enter the regional contest. The contest consists of questions presented in a toss-up/-bonus format along with a problem-solving period. The toss up/bonus questions emphasize quick recall of factual information and the ability to work quick to solve a problem. The problem-solving portion encourages students to work together to find solutions to problems of a non-standard variety. Winners and runners-up from the regional contests receive trophies. All members of participating teams receive certificates.

K-8 Mathematics Curriculum 80

Terry Parks, K-12 Mathematics Director
Shawnee Mission Public Schools
6649 Lamar
Shawnee Mission, Kansas 66202

Target Population: Grades K-8

This program offers a complete K-8 curriculum with teaching suggestions, objectives, and resource correlations. In use since 1977, it is currently being updated to incorporate objectives addressing all levels of Bloom's taxonomy. A management system was incorporated in 1982 which is also in the revision process.

Kentucky High School Mathematics Contest 81

Michael J. Seiler, Contest Director
Kentucky Council of Teachers of Mathematics
P.O. Box 22
Richmond, Kentucky 40475

Target Population: Grades 9-12

The purpose of the contest is to generate interest in problem-solving by high school students. Four sets of five problem exams are given each year. There are two levels of problems: one for Algebra I and Geometry students, and one for students taking more advanced classes. The test is administered by teachers in the participating high schools. KCTM supplies participating schools with four sets of exams and certificates of achievement. Teachers from participating schools submit questions which are used on future exams. We are in our seventh year.

Knox County Mathematics Curricular Program 82

Charleen DeRidder, Mathematics Supervisor
Knox County Public Schools
400 Main Avenue
Knoxville, Tennessee 37902

Target Population: Grades K-8

The overall purpose of this program is to raise the level of student performance in mathematics through a restructured curriculum and to implement a viable program of instructional improvement using traveling mathematics teachers to provide regular, ongoing inservice for teachers. The groundwork for this program began as early as 1973, but the major thrust occurred in 1980-1982 when the Knox County Project received funding under Title II. All Knox County students (K-8) have had the benefit of the written curriculum, however, only students from pilot schools were served by the traveling mathematics teachers during 1980-82. From 1982 to the present, all elementary students and teachers received the service of the traveling mathematics teachers.

Lead Teachers Are Inservice Facilitators 83

Betty D. White, Elementary Programs Supervisor
Duval County Public Schools
1701 Prudential Drive
Jacksonville, Florida 32207

Target Population: Elementary Teachers

There are 97 elementary schools and over 3,500 elementary teachers in the Duval County Public Schools System. The implementation of any new areas of curriculum requires inservice for all teachers. For the past three years, the concept of training two lead teachers from each elementary school has been used to provide inservice training for teachers at individual schools in the areas of computer literacy and elementary mathematics. These lead teachers receive extensive training and are able to replicate the inservice for their faculties.

Leadership Seminar - Problem-Solving by Teachers of Mathematics 84

Kenneth E. Vos, Education Chair
College of St. Catherine
St. Paul, Minnesota 55105

Target Population: Secondary Mathematics Teachers

The goals of participants in this program are to acquire the skill to be effective leaders in their mathematics community; to make a commitment to excellence in mathematics instruction; and to learn new problem-solving instructional strategies. Earlier participants prepared an inservice seminar for their congressional district teachers. There were two teachers from each congressional district. They had to conduct at least two problem-solving seminars for teachers in the academic year. Financial support was made possible by a grant from the Minnesota Department of Education.

Lifetime Math Projects 85

Bunny Bucher, Mathematics Instructor
Roosevelt Middle School
1010 State Street
Belle Fourche, South Dakota 57717

Target Population: Grades 7-8

This is a long-term math project done by small groups of students within the classroom. The students pick the group members and then select the topic they are interested in. I restrict the group size to a maximum of six, and they may choose any topic as long as it bears some relationship to mathematics in real life. They are responsible for gathering all pertinent information, assembling it in some visual manner (i.e., charts, graphs), and presenting it to the class. The students are responsible for critiquing each presentation, and this represents a portion of the final grade for the project.

Linear Algebra, Probability, and Statistics 86

William Wagner, Mathematics Director
North Shore High School
450 Glen Cove Avenue
Glen Head, New York 11545

Target Population: Grades 11-12

In order to provide capable high school students with opportunities to study advanced mathematics, North Shore High School, in conjunction with a local university, Adelphi University, allows high school students to study a semester of Linear Algebra and a semester of Probability and Statistics. Students enrolled in this program receive college credit for the courses studied. The courses are taught by high school teachers, following a curriculum set up by Adelphi.

Local Inservice Request - Mathematics 87

Celise J. Daane, Associate Professor
University of Alabama
P.O. Box R
University, Alabama 35486

Target Population: Elementary Teachers

At a local elementary school in Tuscaloosa, Alabama, the 18 teachers and the principal were concerned that their students' scores on achievement tests were not as high as they would like them to be in mathematics. They decided to use their inservice time to learn more about teaching mathematics to children and to learn how to relieve much of their math anxiety. A consultant from the local university agreed to do the inservice programs. At first the teachers discussed various teaching strategies currently employed in their classrooms. The consultant presented alternative strategies which were discussed. Ability grouping was one of the key elements of discussion. During the second part, teaching aids and supplemental, printed materials were explored. Thirdly, the teachers were introduced to a management program. This was a non-commercial program that incorporated the textbook and other printed material with hands-on activities. Following this inservice, most of the teachers began to implement a new mathematics program in their classrooms.

Logo Computing 88

Art DiBenedetto, Principal
Rolling Hills Primary School
P.O. Box 769, Sammis Road
Vernon, New Jersey 07462

Target Population: Kindergarten

Run as an enrichment program in summer school, this program has been in operation for two years. Kindergarten students are introduced to Logo Computing and receive instruction in Doodle, run, edit, and programming. Using TRS-80 color microcomputers, this inexpensive program allows kindergarten students to delve into geometric shapes, measuring, math operations, area and perimeter, all while enjoying the use of the computer.

LOGO for Mathematics Teachers 89

Claire Jacobs, Mathematics Associate Professor
Rutgers University
Department of Mathematical Sciences
311 North 5th Street
Camden, New Jersey 08102

Target Population: Elementary/Middle School Teachers

For the past two years, Summer Institutes have been conducted for a two/three week period for groups of 24 elementary/middle school teachers. The goal has been to improve the teaching of mathematics in the schools using the computer language LOGO as a motivational device and as an instructional tool. Additional goals are the improvement of problem-solving skills and the achievement of some knowledge of and comfort with the use of microcomputers. The teachers were introduced to the computer language LOGO and the Turtle Geometry. They learned to construct machine programs for various geometric figures and to create original designs. They had hands-on experience with microcomputers including entering, editing, revising, and debugging programs. The program used lecture-discussion, lab time supervised by the instructors, and independent lab time during which a student aide was available. Teachers worked together, two to a computer.

Mastery Learning of Minimum Essentials in Algebra 90

Ross Taylor, Mathematics Consultant
Minneapolis Public Schools
807 N.E. Broadway, Room 308
Minneapolis, Minnesota 55413

Target Population: Grades 8-9 - Advanced Students

In order to receive credit for elementary algebra, students must pass an Elementary Algebra Minimum Essentials Test at an 80 percent proficiency level. Each year four new forms of the Elementary Algebra Test are developed for each of the three trimesters. Early in the trimester, students and parents are shown a sample test and informed that to receive algebra credit, a parallel form of the test must be passed. The first administration of the test occurs two weeks before the end of the trimester, the second administration one week before the end of the trimester, and the third administration during the final week. The fourth form of the test is used as make up for students who did not pass on the first three attempts.

Math Assessment through Random Item Sampling (MATRIS) 91

Alan Maher, Principal
Birch Lane School
Birch Lane
Massapequa Park, New York 11762

Target Population: Grades 2-6

We are able to assess the progress of the math program by periodically testing each grade level with sample test items that are randomly distributed to the children one at a time. The test items are taken directly from the curriculum for N.Y. State. Each item is used only ten times in a grade level. The results are shared with the teachers to help in the improvement of instruction.

Math by Mail 92

Charlotte E. Remaley, Mathematics Curriculum Specialist
Hampton City Schools
1819 Nickerson Boulevard
Hampton, Virginia 23663

Target Population: Grades 5-6

Six years ago Hampton City Schools began the Math by Mail summer program for students who had completed fifth and sixth grades. The program was designed as a maintenance program for students on grade level or a little below. Students completed 25 lessons (each lesson keyed to the Standards of Learning) which were mailed in and graded. A commitment on the part of the child's parent or guardian to supervise the home study was an essential part of the program.

Math Chant **93**

Helen E. Lewis, Principal
Hazel Hart Hendricks School
2605 East 25th Street
Indianapolis, Indiana 46218

Target Population: Grades 4-6

After noticing the need for improvement in computation among grades 4-6 pupils, Mrs. Lewis made up the activity called Math Chant. Through daily repetition, pupils repeated only the multiples of numbers from 2-12. This helped to relate multiplication to counting, to relate products to division, to let pupils see patterns in multiplication, to build speed in response, and to let pupils have fun with the rythmn and motions they developed in groups or individually. On the command, "Chant time go two," the response would be "2, 4, 6, 8,...24." "Chant time reverse two" would give the unison response "24, 22, 20...2, 0." After learning the facts from 2-12, ribbons and certificates are given. Even Chant is the second part of Math Chant. On the command, "Even Chant go eight," a series of products are given and the response must be the missing factor. The final variation is Uneven Chant. The leader says "Uneven Chant go nine." Then any series of numbers is given one at a time and the response must be the missing factor and remainder.

Math Fair **94**

Louise Denton, Coordinator
Irving School
805 South 17th Avenue
Maywood, Illinois 60153

Target Population: Grades K-8

Seventh and eighth grade math students are given the option of choosing a project appropriate for various grade levels. The project must reinforce or present a basic math skill. The project may be in the form of a game, computer program, research paper on a mathematical topic, or geometrical shapes and designs. The overall goals of the Math Fair are to stimulate and enhance all students' skills in mathematics and to motivate students at all grade levels to develop a likeness for mathematics through the use of manipulatives, games, and comprehensive involvement in the fair for the two day period.

Math for Daily Living 95

William Wagner, Mathematics Director
North Shore High School
450 Glen Cove Avenue
Glen Head, New York 11545

Target Population: Grades 11-12 - Low-Performing Students

This course is called Math for Daily Living. This rather unappealing title is misleading. Students enrolled in this course cover such topics as the stock market, income tax, installment buying, insurance, etc. However, this course is filled with many activities that make it exciting and practical to students. The class actually purchases stock. They visit the New York Stock Exchange. Students must go out and price autos and insurance. Students must secure information on loans from several sources and compare. Other activities include pricing one's own funeral. In a unit on coordinate systems, the class studies New York City. Eventually, students are involved in a rally race through New York City to demonstrate their knowledge of the city and the rapid transit system.

Math Honors Club 96

Mila Baldazo, Mathematics Teacher
Northwest Intermediate School
1400 West Goodwin Avenue
Salt Lake City, Utah 84116

Target Population: Grades 7-8

The Math Honors Club was organized in response to the need of accelerated students in mathematics to experience activities directed towards enrichment and to encourage and stimulate, as well as recognize and award, achievement in mathematics. The goal is to develop a positive attitude towards mathematics for future academic and/or vocational endeavors. The methods include enrichment/recreational activities related to mathematics and science; tutoring through the PLUS Project (Positive Learning for Unmotivated/Underachieving Students); and parent involvement through volunteering to direct activities. The length of time in use is five years (from 1981 to date).

Math Manipulatives in the Middle Grades 97

Ann Woeste, Teacher
Edison School
1328 East 22nd Avenue
Eugene, Oregon 97403

Target Population: Grades 3-6

It is my belief that students in third through sixth grades need to learn abstract mathematics concepts through the use of concrete manipulative materials. Developing spatial and visualization skills as well as connecting concrete operations to abstract math concepts, are essential for middle grade students as well as primary students. My program involves the use of concrete objects to teach the four operations, primarily at the fourth grade level, as well as fractions, decimals, and geometry. I have developed these materials and teaching strategies over a period of seven or eight years to the point that I give workshops around the northwest to other teachers.

Math Mastery Program 98

James R. Doyle, Assistant Superintendent
West Bloomfield School District
3250 Commerce Road
West Bloomfield, Michigan 48033

Target Population: Grades 3-8

The purpose of this program is to insure that all students have prerequisite mathematics skills at each grade level for success at the next grade level. Teachers determined from textbooks, standardized test scores, and state math assessment tests the most commonly needed skills that students should master for success at the next grade level. Teachers developed a minimum of 16-17 objectives at each grade level and traded off objectives to insure that everyone agreed on the major focus at each grade level. Professional consultants assisted the district in developing our own criterion-referenced tests. The CRTs are administered in September as a pretest, in February as an interim test, and in June as an exit test. Printouts of the results by way of our own Apple IIe computers give the teachers student groupings by objectives not mastered so that teachers can immediately group students and reduce teaching skills to children who have already mastered particular skills.

Math Memories 99

Linda K. Monfort, Mathematics Department Chair
Rocky Run Intermediate School
4400 Stringfellow Road
Chantilly, Virginia 22021

Target Population: Grades 7-8

Writing across the curriculum is being successfully accomplished in the mathematics classroom in several ways. Students keep a notebook entitled, "Math Memories," in which answers are recorded to questions such as "describe a day in the life of a check" and "two integers are fighting--decide what they are fighting about, why, who you think will win." This process reinforces concept attainment and enables the math teacher to identify concepts that may be more difficult for some students to comprehend. Another method to incorporate writing into the mathematics curriculum is to have students compose their own "word" problems, illustrating the six problem-solving strategies they have been taught. Writing skills are extended and challenged through the integration of problem-solving stategies, math concepts, and the use of computer technology. Activities are designed to help students recognize the usefulness of computers as problem-solving tools and to help them write meaningful computer programs to solve math problems.

Math Olympics 100

Reta S. Smith, Mathematics Curriculum Supervisor
Springfield Public Schools
940 North Jefferson
Springfield, Missouri 65802

Target Population: Grades 5-6

The goals of this practice are to help stimulate the students' interest in mathematics and to help strengthen the students' problem-solving and computational skills in mathematics through a contest format. Math Olympics is scheduled on the third Thursday evening in May of each school year. Each sixth grade classroom may enter one team in each of the team events (Computers, Scavenger Hunt, Computation). Any sixth grade student who is interested may enter one of the individual events (Calculators, Applied Geometry, Conversions, Problem-Solving). Trophies and medals are awarded to the top three places. All participants receive a certificate of participation. Fifth grade students enter exhibits to be displayed the night of the sixth grade events. Seals of excellence are placed on the certificates of the best exhibits. Materials include calculators, computers, and an outdoor obstacle course for the Scavenger Hunt. The first Math Olympics was in 1984, the third one is scheduled for May 1986.

Math Project 101

Linda Daniels, Mathematics Teacher
Mesa Junior High School
828 East Broadway
Mesa, Arizona 85204

Target Population: Grades 8-9

Each semester students must investigate an area of math not normally covered in our curriculum. In the first semester, a five-page report is written on a chosen topic. In the second semester, a three poster project is done on another math topic. The project is to be done outside of class. There are four weeks between the assignment and the due date of the project. The goal is to help students learn about mathematics concepts which are not covered in our curriculum and includes the use of library skills as well as writing across the curriculum.

Math Skills Sequence and Skills Acquisition Measures (SAM's) 102

Harry D. Stratigos, Math/Computer Education Program Coordinator
School District of Lancaster
225 West Orange Street, P.O. Box 150
Lancaster, Pennsylvania 17603

Target Population: Grades K-6

The goal of the program is to provide uniformity, continuity, flexibility, and control (accountability) in the K-6 math curriculum. Also, there was a pressing need to monitor student performance because student mobility for some elementary buildings is as high as 85 percent in a single year. A skills sequence consisting of 398 basic and enrichment math skills is taught by all elementary teachers in 12 buildings.

The district's mainframe computer receives all information from the classroom teachers and generates reports. Materials used include the skills sequence, three commercial publications, a locally-developed Activities Guide and the Skill Acquisition Measures (SAM's) to test mastery. The program has been in place for eight years with three minor revisions and has survived two district Curriculum Cycle assessments.

Math Team Competition 103

Jay G. Frandsen, Teacher
Meyzeek Middle School
828 South Jackson Street
Louisville, Kentucky 40222

Target Population: Grades 7-8

The math team was formed ten years ago to offer students proficient in math the opportunity to further their math knowledge and to see how they compare with other students, not only in Kentucky, but across the country. There are three basic types of competition: Math Bowl, Math Counts, and national math leagues. Math Bowl is similar to College Bowl. There are toss-up questions (10 seconds) and bonus questions (30 seconds). This type of competition requires quick recall in addition to a good understanding of the basic concepts. Math Counts, sponsored by the National Society of Professional Engineers, consists of individual and team written rounds. The questions require a good understanding of the concepts of algebra and geometry along with above-average computational skills. National math leagues give students the opportunity to see how they compare with students across the country. There are different levels of tests given four to five times a year. Each test consists of five to six questions and time varies from 20-30 minutes. Individual and team efforts are recognized.

Mathathon 104

Richard M. Spisto, Assistant Principal
Marta Valle Junior High School 25
145 Stanton Street
New York, New York 10002

Target Population: Grades 7-9

The goal of this practice is to increase the problem-solving ability and mathematics vocabulary of the students. A mathematics dictionary is being developed that contains process words, directional words, and numerical words. Each teacher is provided with a dictionary divided into 12 monthly segments. A uniform math exam is given monthly based on the dictionary words. A monthly Math Bee is held using representatives from each class. Prizes are awarded to Math Bee winners and classes with the highest average on monthly exams. To further assist teachers, a math resource room is available. It is stocked with a generous supply of math materials and techniques to be used for teaching problem-solving.

Mathematical Problem-Solving K-8 105

Carolyn S. Kimbell, Assistant Superintendent for
Curriculum/Instruction
Downers Grove Grade Schools, District No. 58
1860 63rd Street
Downers Grove, Illinois 60516

Target Population: Grades K-8

The goals of this program are to stimulate intellectual curiosity; to develop an appreciation for math; to develop lifelong learning skills; to learn to abstract from the concrete and concretize the abstract; to develop an understanding of concepts and relationships; to become proficient in essential computational skills; to understand math by using concrete objects and applications to everyday life; and to study math at a level of abstraction and difficulty appropriate to the individual. The methods involve whole group, small group, and individual work using the following strategies: Make a List, Look for a Pattern, Guess and Test, and Draw a Diagram. The length of time in use is three years for grades 4-8, and two years for grades K-3.

Mathematics 106

Linda Robertson, Assistant Superintendent
Aurora City Schools
102 East Garfield Road
Aurora, Ohio 44202

Target Population: Grades K-5

To improve both computational and problem-solving skills in mathematics in grades K-5, a prescribed instructional format was instituted in 1984-85. In grades 2-5, teachers must test for basic facts proficiency in speed and accuracy a minimum of three times a week. Instead of using addends as the instructional grouping for math facts learning, we use sums as the instructional grouping. Additionally, problem-solving is taught an equivalent of one day a week using strategies outlined in materials developed in Stark County, Ohio. Children are also pretested on each new unit of instruction to determine their level of knowledge. Remediation and enrichment instruction is then offered to those identified. Enrichment materials consist of horizontal mathematical enrichment including number basis, estimation, geometry, etc.

Mathematics Area Resource Specialist (MARS) 107

Jan Hollis, K-12 Mathematics Coordinator
Iowa City Community School District
509 South Dubuque Street
Iowa City, Iowa 52240

Target Population: Grades 4-6

The Math Area Resource Specialist team has been operating in the district since August 1985. The purpose of the project is to provide specialized math support to classroom teachers. Leadership, guidance, and expertise in the articulation and coordination of the elementary math program is provided by the MARS team in cooperation with the district's K-12 math coordinator. The goals of the project are to facilitate the use of computer software in mathematics classrooms; to develop and model the teaching of specific math units as per the needs assessment; to provide materials for and model horizontal enrichment; to gain an understanding of the district's elementary math program by reviewing math tests to establish inservice priorities and by conducting conferences with teachers and principals; to provide materials and model the teaching of basic math content; and to be involved in the elementary math curriculum review process.

Mathematics at Work in Society 108

Terry Gallagher, Subscriptions Assistant
The Mathematical Association of America
1529 18th Street, N.W.
Washington, D.C. 20036

Target Population: Grades 8-12

MAWIS is a set of materials for classroom use specifically designed to promote mathematics and career awareness for students in eighth grade and above. The MAWIS materials include four 20-minute television video cassettes and a 32-page project book. Each videotape features men and women in careers which depend on mathematics. They are shown on the job, talking about what they do, how they feel about their work, the academic preparation required for their jobs, and how they use mathematics for their profession. The four video cassettes are: An Actuary--What's That?, Mathematics in Space, Mathematics: The Language of Research, and Mathematics: Where Will I Ever Use It. The MAWIS project book, "Opening Career Doors," features over 80 different careers and realistic examples and exercises illustrating how mathematics is used in these careers.

Mathematics Awareness Project 109

Bruce Williamson, Professor
University of Wisconsin - River Falls
Department of Mathematics
River Falls, Wisconsin 54022

Target Population: Grades 5-9

The major thrust of the project was a public relations campaign to acquaint students with the role of mathematics in careers, continuing education, and technology. Print resources, videotapes, and speakers were used with teachers/administrators to increase awareness of the importance of continued study of mathematics. An orientation session was held in September and the evaluation session in May. Thus each school has a seven month period to try various awareness strategies.

Mathematics Consortium Mini-Institutes for Teachers 110

Boyd Holtan, Education Professor
West Virginia University
604 Allen Hall, Box 6122
Morgantown, West Virginia 26506-6122

Target Population: Elementary Mathematics Teachers

Inservice Mathematics Mini-Institutes are being conducted in seven sites around the state for mathematics teachers of grades 4-6. The project is a consortium of state colleges and graduate institutions under a grant from the Board of Regents in the Education for Economic Security Act, Title II. Each Mini-Institute consists of a mathematics class and a mathematics education class of about 20 teachers, usually taught by two selected state college faculty. Each participant takes both classes which are integrated and each uses portions of the same textbook. Students can earn three credits in mathematics and three credits in mathematics education from a state graduate institution of their choice. Since the grant pays the costs of the class, the Board of Regents waives the student tuition and counties may assist teachers with stipends or expenses.

Mathematics Curriculum Pacing Guide 111

Madeline V. Brunelli, Mathematics Coordinator
Southington Public Schools
49 Beecher Street
Southington, Connecticut 06489

Target Population: Grades K-6

The goal of this practice is to assure continuity of the spiral Mathematics Curriculum. The method used is to impose a timeline for coverage of objectives at each grade level. Materials used include a one-page guideline incorporating chapters, month/week objectives, and appropriate teaching materials. This practice was instituted in September 1983.

Mathematics Enrichment Activities for Grades K-6 112

Francis T. Hannick, Mathematics Department Chairperson
Mankato State University
Department of Mathematics
Box 41
Mankato, Minnesota 56001

Target Population: Elementary Teachers

Workshops consist of enrichment activities appropriate for K-6 mathematics curriculum. These activities have been gathered at meetings of NCTM, state organization meetings, and from participants in the workshops. Participants spend part of the workshop time involved in working with the activities in order to know what would work in their classroom setting, what adaptions are needed, etc. They then put the activities into workable form for their own classrooms. The remainder of the workshop time is given to the participants to share activities which they have found to be successful in their own classrooms.

Mathematics Experience Based Approach (MEBA) 113

Susan O'Brien, Elementary Education Director
M.S.D. of Decatur Township/Pentathlon Institute
7523 Mooresville Road
West Newton, Indiana 46183

Target Population: Grades K-4

The MEBA project is designed to develop conceptual understanding of mathematical concepts through the systematic association of the symbol with its concrete and pictorial representatives; to provide teachers with a unique instructional framework to achieve this goal; to improve the "active" problem-solving skills of elementary students from a broad range of ability levels; to acquaint teachers and administrators with the attendant management and evaluation procedures; and to provide parents with interesting home activities for their children to support these efforts. The Pentathlon Institute serves to accomplish these goals through long-term inservice, active classroom demonstrations, and consultation with pilot teachers. A number of materials are utilized including physical models and pictorial representations of mathematical concepts MEBA has evolved over the past three years.

Mathematics Inservice 114

Katherine Pedersen, Mathematics Associate Professor
Southern Illinois University
Mathematics Department
Carbondale, Illinois 62901

Target Population: Elementary Teachers

The goals of this practice are to update mathematical knowledge; to meet local needs; to focus on classroom activities; to develop appreciation for doing mathematics; to refocus elementary efforts away from an answer-oriented curriculum only; to introduce curricular practices, such as estimation and calculator skills; and to provide opportunities to share with other teachers. Packets of readings/-assignments are given to participants in advance of inservice dates. Material involves discussion of content, classroom practices, games, problems, etc. Teachers (participants) prepare for inservice from packet instructions. The inservice has been in effect during the academic year, 1985-86, meeting once a month.

Mathematics Lab 115

Rita LaPresto, Mathematics Department Chairperson
Withrow High School
2488 Madison Road
Cincinnati, Ohio 45208

Target Population: Grades 9-12

This program is designed to deal with the unique problems of high school general mathematics students. These students not only have poor mathematics skills, but have negative attitudes about school, mathematics, and their own ability to succeed. By giving students the opportunity to succeed at their own level, the fear is dispelled and the negative behavior patterns become unnecessary. Concentration on the tasks of improving basic skills, increasing understanding, and developing problem-solving abilities is then possible.

The large classroom accomodates 75 to 125 students comfortably. Three to five teachers work together using a variety of instructional materials and techniques. Pupils are tested, learning experiences are prescribed, help is given, post-tests administered, and the process is repeated. Each student's program, including topics, difficulty level, and learning speed, is determined by his/her own performance and the teacher's knowledge of his/her achievements and needs.

Mathematics, Music, and Art 116

William Annett, Mathematics Department Chairperson
South Side High School
Shephard Street
Rockville Centre, New York 11570

Target Population: Grades 10-12

This practice is a lecture-demonstration on mathematics, music, and art. This one hour presentation includes application of mathematics in music, astronomy, and art. Concepts are illustrated with a live jazz combo.

Mathematics Pentathlon 117

Susan O'Brien, Elementary Education Director
M.S.D. of Decatur Township/Pentathlon Institute
7524 Mooresville Road
West Newton, Indiana 46183

Target Population: Grades K-7

The Mathematics Pentathlon brings parents, teachers, administrators, and learners together in an educational and social event which promotes the development of mathematical concepts and skills. This tournament of mathematics games, to be held in April and May, appeals to a wide range of students at different ability levels and fosters interaction among all segments of the educational community. Its goal and purpose is to give students new opportunities to develop problem-solving skills as well as a more challenging approach for achieving basic skills mastery. This is accomplished by involving children in problem-solving on an active "learning by doing" basis. A wide variety of manipulative materials are used including pattern and attribute logic blocks, fraction bars, and cuisenaire rods. These activities call upon children to use a varied number of approaches that allow the student to systematically develop strategy and reasoning skills.

Mathematics Problem-Solving Inservice Program 118

Arthur A. Finco, Mathematics Education Professor
Indiana University - Purdue University at Fort Wayne
2101 Coliseum Boulevard East
Fort Wayne, Indiana 46805

Target Population: K-12 Mathematics Teachers

The program is a two year series of problem-solving K-12 inservice workshops involving Indiana University-Purdue University at Fort Wayne and the Fort Wayne public and private schools. Each participant attends eight 90-minute workshops on how to be a problem solver and how to implement problem-solving in the mathematics curriculum. The first year participants (at least two teachers from each elementary, middle, and secondary school) will serve as resource teachers in their schools. The second year calls for inservice workshops for all teachers of mathematics in Fort Wayne.

McSiip - The South Jersey Regional Mathematics and Computer Science Instructional Improvement Project 119

Janet Caldwell, Director
Glassboro State College
Robinson Building
Glassboro, New Jersey 08028

Target Population: K-12 Mathematics Teachers

Presently in its second year of operation, McSiip supports, coordinates, and provides inservice activities in the seven southern counties of New Jersey. In FY 1986, ten projects are supported with funding from the New Jersey State Department of Higher Education and the College, with more than five other projects funded by local schools and districts.

McSiip represents an effort on the part of the college to work cooperatively with school systems to improve mathematics and computer education throughout the region. McSiip's mathematics activities focus on areas which are difficult for many students: problem-solving, rational numbers, applications. All of these activities draw upon McSiip's software collection to provide models for using computers in the mathematics classroom. Computer activities have dealt with policy and curricular issues. They have also modeled appropriate instructional behaviors relating to computer education and shown teachers how to use computers as a tool.

Meaningful Mathematics K-4 120

A. Dean Hendrickson, Professor
University of Minnesota - Duluth
217 Bohannon Hall
Duluth, Minnesota 55812

Target Population: Grades K-4

This curriculum was developed to use a psychologically sound approach to establishing the foundational concepts in elementary mathematics firmly in children's minds. Concepts are developed at the concrete level using a variety of manipulative materials and problem-solving related activities. Time is taken to relate symbols to concepts and children generate symbolic representations of their understandings before being asked to respond to prepared symbolic forms. No textbooks or workbooks are used. Instead, forms to record activities with manipulative materials and worksheets to relate symbolic forms to manipulative materials have been prepared and are used. This program has been in use in several schools in Minnesota and some neighboring states for over six years.

Metric Leprechauns 121

Rose Kraft, Mathematics Teacher
Roncalli Junior High School
505 Third Avenue, S.E.
Aberdeen, South Dakota 57401

Target Population: Grades 5-7

The objectives of Metric Leprechauns (Metric Christmas Elves, etc.) are to study and practice using metric measuring and to measure each child and teacher using centimeters, including: a) head (forehead to chin); b) neck (length and width); c) torso (length and width); d) waist (width); e) waist to feet; f) across shoulders; g) shoulder to wrist; and h) feet. The teacher (or students, if able) scale down to tiny size for scale decided upon. Using grid paper and new measures, students draw a small person. These are grouped together on a bulletin board after cutting out and coloring or painting to look like self.

Metric Olympics - Delta Team 122

David A. Frick, Teacher
ETR Middle School
Springfield School District
Woodlawn Avenue
Springfield, Pennsylvania 19064

Target Population: Grades 4-6

The purpose of Metric Olympics is to have students work with metric measurements while competing in various athletic competitions. The specific objectives for students include: measuring metric distances and volumes; experiencing the length of metric distances and sizes of metric volumes; organizing teams, planning competitions, keeping records of results; organizing and preparing descriptive writings; and participating in the day's events. Students are divided into four teams for competition in several events, including frisbee throw, soccer ball kick for distance, water carry relay, egg catching contest, and three-legged race. Team scores are kept and a plaque is presented to the winning team and displayed in the classroom. Each student receives a "Certificate of Participation." We have done this for four years, and the actual project takes one full day, plus 15-20 class periods prior to the "Olympics."

Microcomputers for Mathematics in a Multiple Media Foundations Center 123

Richard A. Alo', Professor
University of Houston - Downtown
One Main Street, Room S629
Houston, Texas 77002

Target Population: Grades 9-12

The University of Houston-Downtown has a multiple media Foundations Center with major responsibilities in mathematics, reading, and writing. For the Mathematics Component of the Foundations Center, a Nestar Cluster One local area network of 22 Apple IIe microcomputers has been created in conjunction with a sophisticated I/O system manned by an IBM PC-AT providing much needed control and scheduling of the enormous number of students making use of the center. This network is used in conjunction with a tutoring function provided by University of Houston-Downtown staff and short videotapes created by our staff on selected units in the developmental mathematics sequence. An additional network is being created with eight Apple MacIntosh microcomputers. In addition, interactive video is being incorporated into the MacIntosh network to integrate computer software with our campus-produced videotapes.

Middle Grades Management Project 124

Jack Halferty, Mathematics Instructor
Lewis Middle School
501 Leavenworth
Excelsior Springs, Missouri 64024

Target Population: Grades 6-8

The existing format in many mathematics classrooms is teacher-directed review, new concept, and practice time. M.G.M.P. materials are activity-oriented rather than teacher and/or book-oriented. Students are actively involved in experimenting, collecting data, and questioning. In general, instruction focuses on developing problem-solving techniques. We feel that these techniques will more likely develop a lasting understanding of concepts and provide an independent basis for developing new learning.

Middle Grades Math Contest 125

Bruce Chester, Teacher
Cincinnati Public Schools
230 East Ninth Street
Cinncinati, Ohio 45202

Target Population: Grades 7-8

The goal of this practice is to create interest in math as exciting, challenging, and fun. The Math Contest is for all students in the middle school grades (7-8) with regional matches and a final playoff. The format has two components: Academic League--students seated by team answer a variety of math questions; and Speed Challenge--students do computation at a standing board like a relay race. Materials needed are questions, tables, public address system, and portable blackboards. This is the fifth year for the Math Contest, and the number of schools participating increases each year.

Middle Grades Mathematics Project 126

Glenda Lappan, Mathematics Professor
Michigan State University
Department of Mathematics
East Lansing, Michigan 48824-1027

Target Population: Grades 5-9

The Middle Grades Mathematics Project (MGMP) has developed four units of curriculum materials each of which represents two to four weeks of instruction. The units developed are Spatial Visualization, Factors and Multiples, Probability, and Similarity. Each unit consists of a detailed unit guide for teachers and student activity pages. The unit guides are written in a format that enhances the teacher's ability to teach the content in an activity-centered, problem-solving mode which captures the interest of students. The goal of the materials is to help students develop a deep, lasting understanding of the mathematical concepts and strategies studied. To help achieve this goal, MGMP materials concentrate on a cluster of important ideas on the relationships that exist among these ideas.

Middle School Ability Grouping in Math 127

Bill Kimber, Principal
Adel-DeSoto Middle School
215 North 11th Street
Adel, Iowa 50003

Target Population: Grades 6-8

Adel-DeSoto Community Schools will be implementing a 6-8 middle school concept beginning with the 1986-87 school year. Students will be homogeneously grouped for math and reading classes. All other classes will be taught as heterogeneous sections. The math classes will be grouped into four sections. The low ability group having fewer students (15-18) while the upper sections will have larger class sizes (20-25). The students will be grouped by using ITBS scores, previous math grades, and teacher recommendations. Class periods will be 44 minutes in length with each group working on skills they are capable of handling. The lowest section will work primarily with survival math skills with the advanced class working to increase math knowledge skills.

Miss Viola Swamp (Classification Old Maid) 128

Jessie H. Gwisdala, First Grade Teacher
H. S. Chase School
Woodtick Road
Waterbury, Connecticut 06705

Target Population: Grades 1-3

The goal of this practice is for students to develop classification categories and strategies. The materials include 52 oaktag cards (3"x5") on which pictures have been laminated. Pictures must be able to be classified several ways. One picture must be Viola Swamp from the book, Miss Nelson is Missing. The game is played according to Old Maid rules. Players must state the criteria of classification. By removing the Viola Swamp card, the game becomes Classification Go Fish.

The game encourages children to develop part-whole relationships. It allows the child to determine the subordinate class and to verbally explain the relation of the subset to the whole. The child learns to deal with conflict when he/she gets the Viola Swamp card and learns to develop various strategies for getting rid of the card. The game format provides socialization.

Multi-Digit Addition and Subtraction 129

Karen Fuson, Associate Professor
Northwestern University
School of Education
Evanston, Illinois 60201

Target Population: Grades 1-2

High-ability first graders and all ability levels of second graders were taught place value concepts and multi-digit addition with regrouping using a wood embodiment of the first symbolic four places. Most children learned to add problems with as many as ten places. All classes except low-ability second graders used the same approach to learn subtraction with regrouping to ten places, including problems with zeros in the minuend. Children this young were able to do the multi-digit problems because they used an efficient method of counting on for adding and of counting up for subtracting the single-digit columns they did not have memorized.

Murder on the Coliseum Express 130

Don M. Jordan, Mathematics Associate Professor
College of Applied Sciences
University of South Carolina
Columbia, South Carolina 29208

Target Population: Grades 7-9 - Gifted Students
Freshman and Sophmore College Students

Murder on the Coliseum Express is an inexpensive, administrative free program which seems to generate a great deal of enthusiasm among students. It is an instructional "murder mystery" in which students must use linear algebra to solve equations in order to discover the "facts" of the case. Using the subjects of linear algebra, combinatorics and statistics and a computer language (such as Pascal), the students must find five unknowns in order to solve a murder. These five unknowns are: the victim, the killer, the motive, the place, and the weapon. All students must participate. The first student with a correct solution is declared the grand winner; there are other winners.

The learning process in this project revolves around student efforts to devise the solution for a carefully designed, closed-end problem. The "clues" which they must decipher to reach a solution are based on the faculty, staff, and students within the college. Local current events are important in the solution also, thus personalizing the problem and heightening interest.

New Fourth Year Mathematics Course 131

Steve Davis, Mathematics Head
North Carolina School of Science and Mathematics (NCSSM)
P.O. Box 2418
West Club Boulevard and Broad Street
Durham, North Carolina 27705

Target Population: Grade 12

The Carnegie Corporation is funding the design of a syllabus for a new fourth year mathematics course. NCSSM's proposal described the four years of progress on the corresponding course at NCSSM. Four years of informal research and testing have led to a syllabus for NCSSM's fourth year mathematics program that is comprised of roughly 70 percent standard text and 30 percent new material written or edited at the school. More importantly, the content and delivery of this course reflect the recommendations made in national reports and journals. Some highlights of this course include: 1) the integration of algorithms into the curriculum; 2) the development of interesting, computer-assisted applications for lessons on functions; and 3) the development of a unit on computer-assisted estimation of the turning points of graphs.

Novel Assignments/"My Team the Great" 132

Joan Landau, Principal
Monticello Middle School
28th & Hemlock
Longview, Washington 98632

Target Population: Grade 7 - Remedial Students
Grade 8

The goals of this practice are to increase student motivation; to provide experience in timed, testing situations; and to provide positive practice on skills. The teacher chooses one captain for each row of desks (with similar math abilities). The rest of the students stand in the back of the room until they are chosen on a team. They then sit in the row of the team on which they are chosen. When the assignment is given, the students work on their own (test conditions) until time is called (usually 10-15 minutes before the end of the period). Each person passes his/her paper to the corresponding person in the row to their left. The teacher then reads the answers and the students grade the papers. The scores of each team are put on the board. The teams leave the room in order of finish, first team first, second team, etc. The last place team cleans up the room.

Nueva Learning Center Mathematics Program 133

Mary Laycock, Mathematics Specialist
Nueva Learning Center
6565 Skyline Boulevard
Hillsborough, California 94010

Target Population: Grades Pre-K-6 - Gifted Students

The Nueva Learning Center Mathematics Program is based on the premise that children must understand the "why" as well as the "how" of mathematics. Following Piaget's theories, the program incorporates different teaching strategies that build on the child's particular level of development. The program relies extensively on the use of manipulative materials to set up situations in which students can discover mathematical principles for themselves. This approach emphasizes the use of alternative strategies for understanding and practicing the same concept. This, in turn, encourages breadth in thinking and depth of problem-solving.

One Hand at a Time 134

Patty Smith, Mathematics Coordinator
School District of Pickens County
Box 375, Route 8
Easley, South Carolina 29640

Target Population: Grades K-4

Developed in 1980, One Hand at a Time is a collection of ideas, stories, strategies, and activities which assist the teacher in successfully teaching the complex skill of telling time. The One Hand approach breaks the broad skill, which so often meets with confusion and frustration in primary classrooms, into a number of smaller subskills. Using a clock with only an hour hand, students are taught sequentially and for mastery the subskills of clock readiness, the hour, before and after the hour, the half hour, and the quarter hour. Then the minute hand is introduced and taught in isolation. When each clock and its function is understood, then the relationship between the two is explained. By this time, students are ready to understand and accurately tell time on a two-handed clock.

Outcome Based Mathematics Program 135

Harold R. Johnson, Superintendent
North Sanpete School District
41 West Main
Mount Pleasant, Utah 84647

Target Population: Grades 2-8

This program is in its second year of operation. Math concepts are identified in 278 terminals, kindergarten level to beginning geometry. A pretest is given to identify each student's level of understanding. Each student is placed in a group according to his/her competency level. When students or teachers feel that a student has mastered a math skill, the student is sent to the testing center. The tests are scored on an electronic scanner. If the student passes at the 80th percentile for most areas, or at the 100th percentile for some, such as time tables, the student goes to the computer operator who shows the student new math options. The computer management system provides a daily printout of class rosters and other management information. Each student's record is maintained indicating the terminal mastered and future options.

Parkway Mathematics Project 136

Richard Lodholz, K-12 Mathematics Coordinator
Parkway School District/Parkway East Junior High School
181 Coeur De Ville
Creve Coeur, Missouri 63141

Target Population: Grades 7-8

The goals of the Parkway Mathematics Project are to analyze, refine, and modify where necessary, the mathematics curriculum in the junior high school. Such modifications will be consistent with recommendations from such groups as National Council of Supervisors of Mathematics, National Council of Teachers of Mathematics, and the National Science Foundation. The project will be accomplished by developing, teaching, revising, and writing a textbook for seventh grade pre-algebra mathematics. Material for seventh grade courses is being written during the 1985-86 school year, and a two-year sequence of courses for seventh and eighth grades will be developed during 1986-87.

Pattern Blocks and Logo 137

Joyce Carter, Teacher
Oyster River Elementary School
Garrison Avenue
Durham, North Carolina 03824

Target Population: Grades 1-2

The Pattern Block and Logo unit is a series of directed problem-solving activities that are designed to facilitate the understanding of distance and angle. On a concrete level, first and second grade students have an opportunity to manipulate three-dimensional pattern blocks to develop these abstract geometric concepts. The unit has two levels of difficulty. First grade children play with the blocks, create patterns, copy patterns, fit blocks into outlines of increasing difficulty, record their solutions with shape templates, create the shapes in Logo using a simplified instant Logo ("Quickdraw"), and record their Logo moves. Second grade children complete a series of pattern development activities, record their solutions with templates, create pattern block shapes in Logo using standard Logo commands. Both units have been used for two years. Teaching materials include a pattern block set, pattern block templates, activity worksheets, Apple IIe computer, Krell Logo, and the Quickdraw program written by Dan Watt.

Personalizing Graphs through Data Collection 138

Sharon Gramelspacher, Teacher
Huntingburg Middle School
5th and Main Streets
Huntingburg, Indiana 47542

Target Population: Grades 5-7

The goal of this project is to give students a firsthand experience of creating graphs by collecting information about their classmates. Each class, either individually or in small groups, designs a question to be put on the questionnaire. The questionnaires are distributed to each class member. After filling out the questionnaire, each student separates the questions and puts them into a folder with that question number. Next the student or small group takes a folder and tabulates the responses. Finally, the information is summarized in a table and a graph. The graphs and tables are displayed to all the classes. Class discussions are held concerning the data. This project usually is completed in a week after an introductory week on reading charts and graphs. This will be the sixth year of conducting this activity.

Practical Math 139

William Wagner, Mathematics Director
North Shore High School
450 Glen Cove Avenue
Glen Head, New York 11545

Target Population: Grade 10 - Remedial Students

This program is a successor to the Sound Foundations course. It is entitled, "Practical Math," and it emphasizes the measurement aspects of mathematics. Students in this course survey school grounds using transits, rangefinders, and other measurement tools. Students build items such as picture frames and string sculptures. The central theme is for students to be able to utilize almost any common measurement tool. The students learn how to read almost any measurement scale, whether it is on a ruler or some other device such as a caliper.

Prime Factorization Card Game 140

Richard Zbylut, Secondary School Principal
International School of Kenya
P.O. Box 14103
Nairobi, Kenya

Target Population: Grades 4-6

This practice is a game to reinforce learning of primes, composites, and factors. The teacher needs to make 48 playing cards (on half index cards) with primes written in one color and the composites in another. The cards are shuffled and dealt out (face up) to four players. Each player arranges his cards face up on the table. Each player tries to use as many cards as possible. He must make a true statement of primes multiplied to equal a composite. A card can only be used once. Players should check each others' statements. If someone is caught with an inaccurate statement, or trying to bluff, that person gets no points for the round and sits out on the next hand. Once a foursome has finished, each player is awarded one point per card used. Keep playing rounds and keep a class scoreboard on the chalkboard.

Problem-Solving: An Alternative Design for Instruction 141

Bruce R. Normandia, Mathematics Supervisor
North Brunswick Township Public Schools
Route 130 and Raider Road
North Brunswick, New Jersey 08902

Target Population: Grades 3-12 - Remedial Students
Special Education Students

The goal of this practice is to improve students' ability to solve problems. The objective is to give teachers an improved instructional technique to better instruct in problem-solving. Teachers are provided with a basal instructional strategy that they need in order to provide a sequenced instructional program for solving problems. The method involves teacher education in order to view improved instructional practice in two phases. Phase I includes heuristic development and practice with students. Phase II involves brainstorming sessions with students for creative critical thinking. This has been in use for three years.

Progressive Mastery Learning Math Program 142

Lois Schramme, Teacher
Leeper Middle School
101 West 11th Street
Claremore, Oklahoma 74017

Target Population: Grades 5-6

When students enter our math program, they are tested to determine placement. Students are placed in a skill level class. All students within that class have met the same prerequisite. When students master the skill being taught and demonstrate 80 percent mastery on a post-test, they move on to another skill. The goal is for students to learn math at their optimal rate through appropriate placement and group instruction.

All fifth and sixth grade teachers, special education teachers, music teacher, librarian, counselor, and assistant principal are involved as either math teachers or facilitators.

We have identified a total of 84 math skill categories. However, not all of them are being offered at the present time. Our program was implemented at the beginning of the present quarter. It has been in practice for five weeks. A variety of materials are used for the teaching of PML, including concrete objects, texts, worksheets, games, and computers.

Project CLIMB 143

Barbara Brenner, Director
Middlesex Public Schools
Middlesex, New Jersey 08846

Target Population: Grades K-12

Project CLIMB is a basic skills program to improve student performance in reading and/or mathematics. It offers a management system to teachers which defines the curriculum and allows teachers to select, create, and use instructional materials tailored to meet individual needs. The project addresses several areas: identifies basic skills in reading and mathematics; provides an evaluation system for each basic skill identified; monitors continuous student progress (K-12); and coordinates instruction of teacher and all support personnel. Teacher-change objectives for the project include: teacher awareness of sequential development of skill acquisition; knowledge allows teachers to incorporate skill instruction into content; lessen dependence on basal text for instruction and more alternative teaching methods; ability to identify student strengths and weaknesses through evaluation materials; and teachers work together to provide unified program of basic skills.

Project SEED 144

Helen Smiler, Director
Project SEED
2236-A McKinley Avenue
Berkeley, California 94703

Target Population: Grades K-6

Project SEED is a nationwide program designed to teach abstract, conceptually-oriented mathematics to elementary school children. SEED is an extra-period supplement to the regular mathematics program, and is taught entirely by professional mathematicians and scientists from major universities and research corporations. The mathematics is presented through the use of a Socratic group discovery format in which students discover mathematical concepts by answering a series of questions posed by the SEED instructor. Project SEED is based upon the assumption that only those who possess an in-depth understanding of mathematics can understand the unconventional and original insights offered by children in an open-ended mathematical dialogue. The initial mathematical topics are chosen from high school and college algebra to reinforce and improve students' computational skills and to help them succeed in college-level courses at the secondary level. Although SEED was originally begun as a program for the educationally disadvantaged, the project has been implemented with all levels of children across the nation.

Quest 145

Marita Eng, Mathematics Department Chairperson
Sandalwood Junior-Senior High School
1750 John Prom Boulevard
Jacsonville, Florida 32216

Target Population: Grades 7-9

The Quest Program is an after-school enrichment seminar for motivating junior high students towards realizing their full potential in mathematics. Objectives for the program address the higher levels of the cognitive domain which often are not correlated into the junior high mathematics textbooks. The seminars provide an arena for flexible and generalized thinking and encourages students' discoveries of mathematical relationships. Through the use of mathematical games, manipulatives, and computers, the seminars provide the opportunity for students: to experience the slow and deliberate process of developing and formulating ideas in mathematics; to develop awareness of the joys and frustrations inherent in doing research; to experience the process of developing flexible sets of procedures for handling problem-solving; and to express independent thought and creativity.

Reading/Mathematics Summer Day Camp Project 146

Olive Danecki, Chaper I Supervisor
Milwaukee Public Schools
P.O. Drawer 10K
5225 West Vliet Street
Milwaukee, Wisconsin 53201-8210

Target Population: Grades K-6 - Chapter I Students

This summer school program for grades K-6 was begun in 1977 to improve mathematics achievement through art, music, nature, and physical education activities. A team of five teachers (each a specialist in mathematics, reading, art, music, or physical education), three naturalists, and three aides are assigned to a group of 80-90 students. Field trips are taken to nature sites that complement the areas of study. All activities are designed to reinforce mathematics instruction.

Real Life Banking Skills 147

Karen Mayer, Basic Skills Instructor
Lounsberry Hollow Middle School
P.O. Box 219, Sammis Road
Vernon, New Jersey 07462

Target Population: Grades 5-8

The goals of this practice are to teach real life banking skills and to motivate middle school students to do their homework. Homework assignments are given a monetary value and put into individual folders. Folders are given back weekly and checks or deposit slips are written. Money is added or subtracted from individual accounts. Students may earn extra money by doing extra credit work. At the end of the marking period, the student with the most money earns one free homework pass. The students not only master their addition and subtraction skills in a motivational manner, but also know how to write out checks, deposit slips, and statements.

Remedial Math - Computers 148

George M. Marchal, Principal
Stratford Avenue School
Stratford Avenue & Weyford Terrace
Garden City, New York 11530

Target Population: Grades 3-6

This remedial math program is designed to teach, reinforce, and tutor students on a weekly basis. These children are remediated individually or in small groups. Materials are used that enable children to follow regular classroom activities. Computers are used as a tutorial tool and enable the child to work on selected skill areas that may be posing problems. Correct responses are rewarded and incorrect responses are followed by tutorial type explanations.

Restaurant Math 149

Richard Zbylut, Secondary School Principal
International School of Kenya
P.O. Box 14103
Nairobi, Kenya

Target Population: Grades 4-6

Restaurant Math is a practice to reinforce decimals and percents. As a homework assignment, students are asked to design a menu. They are encouraged to pick a snappy restaurant name or to have a theme restaurant or one that has weird or funny food (i.e., lizard eyeballs). The menu should be eye-catching and well-designed with prices that are not even dollar amounts. The teachers should either buy or make sales receipts with places for date, food order, subtotal, tax, tip, total bill, amount paid, and change given.

The classroom is set up like a restaurant with half of the class acting as patrons, and the other half as waiters/waitresses. The waiters/waitresses take meal orders, total up food bill, calculate six percent tax, check tip and total bill calculations, and calculate change. The patrons participate by checking bill calculations, calculating a 15 percent tip, adding total and tip, checking change, and signing receipt if everything is accurate.

Retraining Experienced Teachers To Be Mathematics Teachers 150

Jim Henkelman, Program Coordinator
College of Education
University of Maryland College Park
College Park, Maryland 20742

Target Population: Non-Mathematics Teachers

The University of Maryland College Park, College of Education and the Anne Arundel County Board of Education have entered into an agreement to offer a retraining program tailored to the needs of the non-mathematics teacher wishing to become a mathematics teacher. A master's degree program has been developed to be offered on-site with two goals: providing an appropriate sequence of mathematics courses leading to certification, and providing appropriate pedagogical courses to enhance the teaching of mathematics. Each mathematics course is designed to model exemplary teaching.

Saturday Enrichment Series - Gifted Math Program 151

Betty J. Krist, Co-Director
Gifted Math Program
SUNY/Buffalo
560 Baldy Hall
Buffalo, New York 14260

Target Population: Grades 4-6 - Gifted Students

The Saturday Enrichment Series of the Gifted Math Program is intended to encourage the interest and study of mathematics by Buffalo and Niagara Falls students in fourth through sixth grades. We extend concepts of elementary school math, develop test-taking skills, and provide students with increased awareness of the opportunities available to those who study mathematics. We are particularly interested in increasing the participation of racial minorities and females who are typically underrepresented in mathematical classes at the secondary level. This project has been in existence for four years.

Sets, Probability, and Statistics 152

Iris Elfenbein, Education Relations
American Council of Life Insurance
1850 K Street, N.W.
Washington, D.C. 20006-2284

Target Population: Grades 10-11

Sets, Probability, and Statistics is a computer program for students which teaches the mathematical concepts of sets, probability, and statistics by relating them to life insurance. Topics covered include sets, sample spaces, probability, statistics, the mortality table, compound interest, premium calculation, and the uses of life insurance. The program, written in Apple PILOT, includes four disks, a teacher's guide, and a student workbook with more than 75 problems and experiments under the topics listed. The workbook can be used alone or with a computer.

Sound Foundations 153

William Wagner, Mathematics Director
North Shore High School
450 Glen Cove Avenue
Glen Head, New York 11545

Target Population: Grade 9 - Remedial Students

In our high school we offer a course called "Sound Foundations." The course is a remedial math course whose major theme is music. The course is a game simulation approach, in which each student is the promoter of a rock music group. The students must do everything: buy instruments and costumes, book rehearsal time, cut records, book local and national tours. The students must manage their money wisely and are constantly doing real world computations. For example, a random number generator indicates how well each student's record has sold that week. The student must pay each member of the band by first deducting the expenses and commissions paid to agents, promotors, record companies, etc. This process is continued throughout the course. Students book national tours by checking hotel rates, airplane rates, etc., and then give a concert in a location such as the Hollywood Bowl. The size of the audience is determined by random number generator.

Space Battleship 154

Richard Zbylut, Secondary School Principal
International School of Kenya
P.O. Box 14103
Nairobi, Kenya

Target Population: Grades 4-6

Space Battleship is an exercise for a coordinate grapning unit. Students should be taken through the setup step-by-step. Have everyone fold a piece of graph paper in half (top to bottom) and outline a 20 X 20 box both in the top and bottom areas. The bottom left corner is (0,0). Number each line out to the right and each line up to the top. Then have each student place his "ships" (in secret) on the top grid. Go through the placing of ships one at a time. The ships may be placed vertically, horizontally, or diagonally. Make sure that the students are placing each of the ship parts on an intersection of the graph lines. Explain that the student's HITS and MISSES will be recorded on the bottom grid. Use X for HIT and 0 for MISS. Students should alternate in calling. Do not tell what ship has been hit, just say "HIT." A person should be told when he has destroyed another's ship. Continue play until a victor has been declared.

Statewide Criterion-Referenced Mastery Testing in Mathematics 155

Steven Leinwand, Mathematics Consultant
Connecticut State Department of Education
Box 2219
Hartford, Connecticut 06145

Target Population: Grades 3-8

The Connecticut State Department of Education is currently implementing a new program of fourth, sixth, and eighth grade criterion-referenced mastery tests. Unlike basic skills proficiency tests or norm-referenced achievement tests, these new instruments assess essential, yet reasonable, skills that reflect the breadth of the mathematics curriculum. All state fourth graders were tested in October 1985. The sixth and eighth grade tests were piloted at the same time in preparation for full administration in October 1986. Each test includes four items per objective and mastery has been set at three out of four.

SUPERSTARS II 156

Andy Reeves, Elementary Mathematics Consultant
Florida Department of Education
Knott Building
Tallahassee, Florida 32301

Target Population: Grades 1-5

SUPERSTARS II is a curriculum enrichment package designed to reinforce Flordia's "Skills for Excellence" in elementary mathematics. The goal is to provide a consistent opportunity over a several year period for self-motivated children to practice higher-level thinking skills. The only written materials needed to implement the program are the two packages: SUPERSTARS II (Primary) and SUPERSTARS II (Intermediate). A school also needs a dedicated volunteer or team of volunteers (depending on the size of the school), or someone outside the classroom, who can devote several hours per week to managing the system. This is the first year for SUPERSTARS II, the original SUPERSTARS I has been in use for two years.

Taylor Eastbrook Mathematics Project (TEMP) 157

William A. Ewbank, Mathematics Education Associate Professor
Taylor University
Upland, Indiana 46989

Target Population: Elementary Education Majors
Grades 1-6

Starting in 1971, the classes of the local public schools have increasingly been opened to the pre-service teacher math education classes of Taylor University. Originally ten teachers volunteered to hand over their students one period a week for math lab sessions. For the last ten years, growth in school enrollment has restricted the work to grades 1-6, all classes in Upland and Matthews being involved (19 in all). Teams of two to three college students plan all lessons once a week, remaining with the same class for one whole term. Teams comprise a leader from MAT 202 and one or two assistants from MAT 201, who learn the ropes in an apprenticeship manner. The latter students then become the team leaders the next term, teaching a different class. The emphasis in on active mathematics, and every conceivable type of teaching device and aid, commercial and home-made, is tried out including Cuisenaire rods, geoboards, games, puzzles, calculators, and measuring equipment. The project also includes outdoor math activities and short field trips.

Teacher Education 158

Harold Melnick, Graduate Faculty
Bank Street College
610 West 112 Street
New York, New York 10025

Target Population: Elementary Teachers

In the context of a graduate level mathematics methods course and through the use of varied manipulative materials, teachers are encouraged and supported in the learning and relearning of mathematical concepts in a way that makes them effective teachers. The teachers are initially given a Piagetian perspective and then quickly move to a hands-on, problem-solving approach to all mathematics curriculum. Teachers learn to use pattern and manipulative materials to enhance their own knowledge of mathematics and thereby meet the needs of children in regular and mainstreamed classrooms.

Teaching Arithmetic by the Use of Standardized Rules 159

Margaret M. Williams, Educational Consultant
Arrival, Inc.
2409 Hillsboro Road
Nashville, Tennessee 37212

Target Population: Grades 5-College
Elementary Teachers
GED Students

The goals of this practice are to standardize the rules for arithmetic, thus eliminating the confusion experienced by students being taught the same concept by different methods; to learn the language of mathematics; and to focus on "processing" information. The materials used include the book, The Key to Success in Mathematics. This practice has been used for 15 years by an individual teacher.

Teaching Effective Problem-Solving 160

Peggy House, Project Director
University of Minnesota
360 Peik Hall
159 Pillsbury Drive, S.E.
Minneapolis, Minnesota 55455

Target Population: K-12 Mathematics Teachers

This project utilizes a leadership training model to develop a consistent focus on problem-solving and higher order thinking skills throughout the K-12 mathematics curriculum. Twenty five teachers received direct instruction in problem-solving and teaching with a problem-solving focus. Of these teachers, eleven received additional leadership training to enable them to function as building resource persons with responsibility to deliver inservice education to all mathematics teachers in their respective schools. Inservice sessions, analysis of videotapes of teachers during problem-solving lessons in their own classrooms, and demonstration teaching by the teacher trainers and others are included. During the 1985-86 school year, emphasis is on assuring that every teacher incorporates problem-solving into the daily mathematics lesson and on increased flexibility in student grouping and interaction patterns. In 1986-87, attention will be directed toward the systematic integration of topics and experiences at various levels of the K-12 curriculum.

Teaching for Creativity 161

John Durnin, Education Associate Professor
Villanova University
Department of Education
Villanova, Pennsylvania 19085

Target Population: Grades 6-12

The primary goal is to help students to become contributors to the advancement of knowledge and culture. Creativity is defined locally as a process to bring into being something new in the classroom. Curriculum text material is viewed as a system of elements, relations, and operations. Questions can be raised and students can engage in creative behavior with regard to the system. Eleven categories of creative endeavor have been identified, including generating problems and statements about the system, modeling, discovering new elements, relations or operations, and finding parallel systems. A secondary goal of the approach is to allow students to appreciate different perspectives and to increase confidence in their own creative ability.

Teaching Fractions with Understanding 162

Albert B. Bennett, Jr., Mathematics Professor
University of New Hampshire
Department of Mathematics
Durham, North Carolina 03824

Target Population: Grades 3-8

This practice involves a combination of a reading-writing program with the use of games and computer-aided instruction for teaching readiness of fraction concepts and computation. At the beginning of the school year, each student is given a deck of fraction bars and the teacher shows one or two students a game from Fraction Bars Step by Step Teacher's Guide. The students are then responsible for teaching their game to the other students. These introductory games provide readiness for fraction symbols and operations. A set of seven diskettes, called Fraction Bars Computer Programs contain some of these games as well as readiness for fractions and instruction in computing with fractions.

Teaching Geometry Using LOGO 163

Louis Corbosiero, Mathematics Teacher
Pollard Middle School
200 Harris Avenue
Needham, Massachusetts 02192

Target Population: Grade 7

Instead of using a chapter on "Geometry" from a grade seven mathematics textbook, I decided to use the computer (Apple IIe) and LOGO (Terrapin) to teach those concepts. I found, adapted, and/or wrote 36 activities that the students could work on independently to learn and to practice those geometric skills. The unit takes about three weeks to complete.

To my knowledge, geometric concepts have never been taught solely using the computer and LOGO. Each student is given the unique opportunity of having diagrams drawn to scale, showing exact angle and side relationships. Since these diagrams are clear, concise, and exact, the students can explore, examine, and really understand geometric relationships.

Teaching Mathematics with Computers: K-12 164

Chuck Thompson, Education Professor
University of Louisville
School of Education
Louisville, Kentucky 40292

Target Population: K-12 Mathematics Teachers

This program has been in effect for two summers (five weeks each summer) and has trained 70 K-12 teachers of mathematics. Teachers earned six hours credit. Courses took place in computer rooms in local schools and each teacher had a computer to use at home during the summer. The goals were: to use software, LOGO, and BASIC to teach mathematics more effectively; to improve teachers' knowledge of mathematics content; and to improve teachers' problem-solving skills and prepare them to teach problem-solving in their classrooms. Courses were team taught by a mathematics educator and a mathematician.

Team Accelerated Instruction (TAI) Math **165**

Barbara Bennett, Dissemination and Training Coordinator
The Johns Hopkins University
Center for Social Organization of Schools
3505 North Charles Street
Baltimore, Maryland 21218

Target Population: Grades 3-6

TAI is a program for grades 3-6 which enables students to master basic mathematical concepts and computational skills utilizing cooperative learning to address diverse ability levels within the math class. The program motivates students to progress quickly through a prescribed sequence of skills. This process is based on the concept that more learning takes place when students work together in teams to achieve shared goals. This encourages students to help each other, motivates students to learn at a faster rate, frees the teacher to provide direct instruction to small groups and individuals, and allows students to develop more responsibility for their own learning.

Developed in 1980 by researchers Robert Slavin, Nancy Madden, and Marshall Leavey at JHU, TAI comes in a book format. A classroom set of 120 books helps to free the teacher of many management and clerical responsibilities resulting from attempts at individualizing math instruction to meet the needs of students.

Team Teaching **166**

William Wagner, Mathematics Director
North Shore High School
450 Glen Cove Avenue
Glen Head, New York 11545

Target Population: Grades 9-12

Team teaching is an almost out-of-date concept in education, except in the mathematics program at North Shore High School. Three pairs of teachers are currently working in team teaching programs. In these programs, both teachers teach the class. Both teachers are always in the room together and plan together. For the most part, they teach a group of 20 to 30 students. Thus far, this program has only been used with remedial classes because these classes allow for a good teacher/student ratio. The teachers find that while one teacher instructs the entire class, the other can watch from the back to check for student problems of either behavioral or intellectual type. The second teacher can take aside a small group for special help or for enrichment. In addition, each teacher learns from the other. Professional development takes place in which teachers learn about the methods and techniques used by their colleagues.

Telewriter Math 167

Ronald Simcox, Superintendent
Elementary School District 181
55th and Grant Street
Hinsdale, Illinois 60521

Target Population: Grade 6 - Advanced Students

District 181 instituted a modified form of interactive video 15 years ago in order to offer district children with high math abilities and interest an opportunity to work at a more advanced pace under the direction of a math specialist. The math specialist broadcasts daily from her specially-equipped office at one of the schools. She teaches by using a writing tablet that can be viewed by students in special classrooms across the district. She transcribes problems and solutions while talking and listening to students over an interactive audio system. Visual communication is limited to the work displayed on the writing tablet.

This program enables students from seven schools to learn together from one master teacher without having to leave their buildings. Aides are located at each building to provide individual attention and help with classwork. The teacher reinforces her relationships with students by visiting different schools each week, talking with students face-to-face.

THA-MASTER 168

Madeleine Long, Director
Institute for the Advancement of Mathematics and Science Education
Long Island University
Brooklyn, New York 11201

Target Population: Elementary and Secondary Teachers

The objectives of this program are: to assist experienced teachers who are not mathematics majors to obtain certification to teach mathematics in secondary schools; to provide rejuvenation to some teachers in mid-career; to offer the opportunity for mobility and advancement to others within the profession and assist minorities and women to enter the field of teaching mathematics; and to help meet the need of school districts nationwide to recruit qualified personnel to teach mathematics in secondary schools. Each participant earns three undergraduate and fifteen graduate credits in mathematics. Each of the six courses in the program is ten weeks in length and consists of 60 hours evenly divided between lectures and workshops. The workshops provide participants with the opportunity to clarify concepts taught in the lectures and to extend the applications of the lectures.

Thinking Approach to Problem-Solving (TAPS) 169

Carolyn Talton, Teacher Education Assistant Professor
Louisiana Tech University
College of Education, Department of Teacher Education
Box 3061
Ruston, Louisiana 71272-9989

Target Population: Grades 3-5

Students were given a pretest of routine, one-step word problems to determine a baseline for data collection. Five 45-minute lessons were presented to each group and a post-test was administered to determine if any significant differences occurred. The goals of the teaching procedure were to teach the three "actions" of solving word problems. The actions for the third grade students were: to combine two or more groups (add); to separate a group into parts (subtract); and to compare two or more groups to find a difference (subtract). The fourth grade students were taught: to combine equal groups (multiply); to combine unequal groups (add); to separate a group into equal groups (divide); to separate into unequal groups (subtract); and to compare for a difference (subtract). Fifth grade students were taught the same process with the addition that sometimes, we compare to find a ratio and we may divide to simplify that ratio.

Topic Math Program 170

Judy Gill, Department Chairperson
Twin Spruce Junior High School
7th and Gillette
Gillette, Wyoming 82716

Target Population: Grades 7-8

The Topic Program is a semi-individualized mathematics program for seventh and eighth graders. At the beginning of each nine weeks, students are pretested on specific math objectives. Based on the results of these tests, students are grouped into classes with students of similar abilities. After three weeks of traditional classroom instruction, the students are post-tested. Students who have mastered the material move on to the next area, and students who have not mastered the material repeat it for another three weeks. Students' records are maintained by a district-developed computer program utilizing an Apple IIe computer.

Total Education Concept: Manufacturing Enhanced Curriculum (TEC-MEC) 171

Martha Brand, Personnel/Curriculum Coordinator
Polaris Vocational Center
7285 Old Oak Boulevard
Middleburg Heights, Ohio 44130

Target Population: Grades 10-12 - Advanced Students

The primary purpose of the TEC-MEC I and II is to teach a high-technology machines trade program. It is noteworthy for its multi-district collaboration, its partnership between school and industry to address the issues of student employability, its academic and vocational compatibility, its commitment to provide positive outcomes for graduates, and its transferability to other school districts. The student is expected to coordinate both technical and manipulative skills together. The student is required to attend a combined Algebra II and Trigonometry class for the first year and a Physics class the second year of the TEC-MEC program, thus blending the mental application and the machines trade program. It is a high level of math and science and enrichment of the shop and related courses with industry inservice training and high-tech experience in the curriculum.

Total Instructional Management with a Local Area Network 172

Ron Ward, Technology Coordinator
Shakopee Public Schools
505 South Holmes
Shakopee, Minnesota 55379

Target Population: Grades 4-12

Full year scope-and-sequence software has been developed for mathematics in fourth through twelfth grades. This software runs on Corvus Local Area Networks which allows up to 60 students to access the software simultaneously. All student responses are stored automatically on the hard disk, allowing the teacher to totally manage all students by objective with mastery. There is also a totally integrated test management portion with time and objective analysis across all classes. No students or teachers have to handle floppy disk drives or diskettes. This project has been an official Technology Demonstration Site for the State of Minnesota.

Use of Materials That Enhance Instruction 173

Matthew Scaffa, District Mathematics Supervisor
Diagnostic Prescriptive Arithmetic of Staten Island
Community School District No. 31
211 Daniel Low Terrace
Staten Island, New York 10301

Target Population: Grades 1-6

In order to achieve the goals of raising student achievement and improving the quality of mathematics instruction, DPA turns to a variety of materials. Concepts are developed and modeled through hands-on experiences with physical materials. Ongoing diagnostic tests are utilized to identify conceptual weaknesses and skill deficiencies. The DPA Teacher's Manual is a source of valuable activities which are attuned to student needs and provide opportunities for individual and small group instruction. DPA is a nationally validated program which is inexpensive to implement. More than 11,000 teachers and supervisors nationwide have been trained in this program.

Use of Special Curriculum Material - Practice, Practice, Practice 174

Joan Landau, Principal
Monticello Middle School
28th and Hemlock
Longview, Washington 98632

Target Population: Grades 6-8

The math department at Monticello Middle School decided that there were two specific needs. First, classes should be taught progressively, topic by topic (i.e., whole numbers, decimals, prime numbers, fractions) rather than page-by-page from a textbook. The textbook is used, but only as a resource. The second need was that regular review and practice of previously learned material must be built into the program to insure that students maintain their skills. Three members of the staff designed a textbook, Practice, Practice, Practice, to use as a supplemental source of problems on the various topics. The book contains over 10,000 problems. It eliminates the need for ditto sheets for practice.

Using Computers in Mathematics 175

Marie Rhatigan-Carroll, Mathematics Chairperson
Albert Leonard Junior High School
25 Gerada Lane
New Rochelle, New York 10804

Target Population: Grades 7-8

The goal of this program is to teach programming in BASIC through the mathematics curriculum. Beginning programming often uses graphics only or a combination of graphics and "message printing." By using mathematical problems, we are reinforcing math skills as well as teaching programming skills. A student must know how to solve a problem before he/she can "teach" the computer to do it.

One period per week, the computer science teacher works in math class using the math curriculum to teach programming skills. Materials used include Apple IIe computers, DEK terminals, math textbook, and teacher-prepared materials.

Using Manipulatives to Develop the Concept of Inverse Operations 176

Kayleen Skinner, Teacher
Longfellow Elementary School
Seventh Street
Belle Plaine, Iowa 52208

Target Population: Grades 1-5

The idea of inverse operations in mathematics (addition/subtraction, multiplication/division) is a key concept. It is very helpful, but often difficult, to develop the inverse relationship between the first operations studied, addition and subtraction, in the early and middle primary grades. By covering a determined number of counters (the whole), removing some (a part) which can be seen, and prompting students to find the missing part which remains under the cover and cannot be counted, students are encouraged to view "whole-known part=unknown part" as "known part+unknown part=whole." This is especially effective in allowing students to use known addition facts to solve subtraction facts. This method has been used by a first year teacher with great success.

Using the Calculator to Teach First Grade Math 177

Joan Spiker, First Grade Teacher
Northview Elementary School
300 Griffith Drive
Manhattan, Kansas 66502

Target Population: Grade 1

Classroom use of the calculator provides children the opportunity to "grow up" with technology. Each student had a solar calculator during the fall semester of 1985. A highly successful set of activities was developed to teach and reinforce the regular math skills in first grade. The activities were designed to teach and reinforce place value, problem-solving, meaning and use of numbers, listening skills, ordinal numbers, the guess and check strategy, and reading number words. The classroom teacher felt that the primary goals of her program were to teach: what calculators are, what calculators do, and how to use calculators.

Videotapes for Inservice Training for Active Learning (VITAL) 178

Susan R. Stockdale, Education Assistant Professor
University of Minnesota, Morris
Division of Education
Morris, Minnesota 56267

Target Population: Elementary Teachers
Elementary Education Majors

VITAL consists of 12 tapes intended for use in inservice programs for elementary classroom teachers and elementary education majors. Each tape shows a teacher demonstrating how to use a mathematical manipulative (cuisenaire rods, pattern blocks, attribute blocks, geoboards, tangrams, or base ten blocks); how to teach a mathematical concept (probability or problem-solving); or how to use a special teaching technique (extending a worksheet). Each teacher is working with a classroom of students. A manual accompanies the set of tapes and helps classroom teachers further explore and extend the content of the tapes.

Videotaping of Class 179

Gregory Baran, Principal
Garwood Middle School
4967 Garwood
Fairview, Pennsylvania 16415

Target Population: Grade 6

During the past few weeks, I have used the video camera equipment to tape my student teacher teaching sixth grade math classes. The use of video equipment is useful in analyzing motivational techniques and improving classroom instruction for math students.

Winter Holidays around the World 180

Angie Davis, Teacher
Pattonville Heights Middle School
195 Fee Fee Road
Maryland Heights, Missouri 63043

Target Population: Grade 7

Through this program, the learner will locate places on a map and find the distance traveled by using a scale on a map. The student will budget a given amount of money to travel from city to city and have enough left to return home. In addition, students will have to calculate the cost of meals from a menu, to compute sales tax from the price of the meals, to know the type of money used in the country traveled, and to know where to find the exchange rate between the two countries. This math unit is different because the students are taken on an imaginary trip, for an entire week they are not in the classroom but traveling around Europe. They make choices about where to go, what to eat, where to stay, and how to spend their money.

Section II

SCIENCE PRACTICES

Activity Centered Science 7-12 181

James Klausen, Science Chairperson
Miller Place High School
15 Memorial Drive
Miller Place, New York 11764

Target Population: Grades 7-12

The Miller Place School District has developed an activity centered, self-paced science program in grades 7-12. This program was written by our staff starting back in 1974. It was our goal to have students learn science by an active participatory process because this produces more comprehensive and longer lasting learning. Students are placed in heterogeneous classes so that slower students have good role models of social and academic behavior. Activity packets are used to teach each unit. Optional investigations are available for the more able or ambitious students to extend their knowledge of the topic. Students work in groups where interactions help the learning process. Program development is ongoing.

Activity-Oriented Laboratory Science Program 182

Richard Clark, Curriculum Specialist
Washington School District
8610 North 19th Avenue
Phoenix, Arizona 85021

Target Population: Grades 4-6

The goal of this program is to improve Health and Science instruction in the Washington School District. The procedures used to achieve this goal include: laboratory facilities provided for all students in grades 4-6; science classes staffed by trained science teachers; Science Scope and Sequence followed in classes; Science Assessment and Pacing Guide followed in classes; a teacher-developed district laboratory handbook for directing expected laboratory outcomes; Basic Skills Tests for monitoring pupil progress; and a minimum of 300 minutes per six day schedule followed with a minimum of 50 percent time devoted to hands-on laboratory activities. Each operational procedure has been devised to stand alone. Using all these procedures together results in a balanced total program.

Anchorage School District's Elementary Science Program 183

Emma Watson, Science Specialist
Anchorage School District
P.O. Box 196614
Anchorage, Alaska 99519-6614

Target Population: Grades K-6

The Anchorage School District developed an Elementary Science Center to support, guide, and provide materials for moving towards excellence in elementary science teaching. The curriculum is hands-on, process-based, and all equipment and materials are provided for teachers in kits which are rotated throughout the system. Having materials continually maintained and available helps to take the pain out of teaching science. The teachers can devote energy and time to the actual instruction rather than the collecting of materials. The Science Center was started in 1977 and has continued to expand to meet the needs of the Anchorage students.

Annual Fall Aquatic Study - Central Junior Style 184

Don Kreisman, Science Department Chairperson
Parkway Central Junior High School
471 North Woods Mill Road
Chesterfield, Missouri 63017

Target Population: Grade 7

The main goal of this program is to have students use an aquatic site as an alternative learning area and to collect their own chemical and physical data as well as plant and animal samples to use throughout the school. Students are trained prior to the trip through the use of a teacher-developed videotape and field trip packet designed for their ability level. Students are taught to use the chemical test kits, physical test equipment, and safety measures prior to the trip. This sequence gives the students coming from several elementary schools a common starting point for their study of life science. This procedure also gives the students ownership of the samples they use in the classroom throughout the year. Training and follow-up activities are geared to the different ability levels of students.

Archaeological Field Schools 185

Tony Schwinghamer, Education Programs Director
The Center for American Archeology
Department X
Kampsville, Illinois 62053

Target Population: Grades 6-12

The Archeological Field Schools provide archeological experiences to students at the junior high level and above. The program provides these experiences through a combination of slide-lecture discussions, laboratory work, and actual field site work. The specific content of the learning experience is dependent on the length of time available and the grade level or experience of the student group. The program aims not to train future archeologists, but to allow students to participate, in a meaningful way, in an actual archeological project. At the same time, students develop disciplined work habits, a personal sense of responsibility, and commitment to a defined task. In addition, the exposure to thousands of years of human history and to the different civilizations and lifeways of the past helps students gain new insights into contemporary studies and problems.

Auxiliary Videotapes for Low Achieving Students 186

Richard A. Lewis, Principal
Clarion Area High School
219 Liberty Street
Clarion, Pennsylvania 16214-1898

Target Population: Grade 8

Our junior high science program strives to give students insight into using the scientific method of problem-solving. The Natural World, which was formally the Intermediate Science Curriculum Study program, in itself, provides abundant activities in which students must formulate plans to determine the nature of things. Activities which can be most enlightening sometimes prove to be most elusive for students with low ability or lesser degrees of interest. A videotape of about five minutes is available in the back of the room for students to see as many times as they need. The program has been here for about five years.

Awesome Science 187

Lois Montgomery, Science Teacher
Rocky Run Intermediate School
4400 Stringfellow Road
Chantilly, Virginia 22021

Target Population: Grades 4-7

The goal of this program is to keep and hold student interest in science throughout the year. This is achieved through weekly hands-on activities, which amaze students with their outcomes, following a principle of science. The equipment for the science activities varies but includes common lab equipment, kitchen supplies, or scrounged materials such as spools, straws, cabbage juice. These activities capitalize on young adolescents' interests in the amazing or puzzling, and their need to handle and manipulate things.

Behavior of Light 188

Sandra Jordan, Eighth Grade Teacher
Glen Meadow School
P.O. Box 516
Vernon, New Jersey 07462

Target Population: Grades 6-8

The goal of this practice is to observe the behavior of a single light beam as it: a) passes through a lens; b) passes through media of varying densities; c) strikes a shiny surface; and d) strikes a dull surface. A laser beam is used as the principle light ray. This instrument replaces the film projector or flashlight to direct a beam of light through or onto different materials. The materials needed include a set of standard convex and concave lenses, flat and curved mirrors, and any dull surface. This practice has been employed in grades six and eight for four years.

Bermuda Workshop Program 189

Andrew T. Maneggia, Supervising Principal
Vernon Center Middle School
777 Hartford Turnpike
Vernon, Connecticut 06066

Target Population: Grade 8

The Vernon Bermuda Workshop, as it is called, was designed to dynamically enrich the teaching of ecology in a locale somewhat exotic to most New England students using the facilities of a world reknown marine research institution. The general objectives of the course are: to promote a trained sense of environmental factors so that an almost automatic check of basic parameters seems natural; to develop an awareness of the interrelations between the many scientific disciplines; to demonstrate through the station itself, the far reaching impact of a specialized research facility and the necessity for an increase in the sum total of knowledge; and to demonstrate that science as a life work though having moments of high adventure, physical challenge, etc., is 90 percent testing, analysis, reference work, and less romantic labor. Using the Bermuda Biological Station as a home base and laboratory, students are involved in an intensive eight day experience encompassing many of the science disciplines.

Biology III - Microbiology 190

C. Lance Hutton, Superintendent
Lexington High School
23rd and Aull Lane
Lexington, Missouri 64067

Target Population: Grades 11-12

Students learn and apply correct lab procedures related to the field of microbiology. Each technique is described and students perform the lab technique. Students should be able to understand and correlate the background information from lecture to the experimentations. Students learn the importance and uses of microorganisms to the scientific field and man. Students learn to identify microorganisms by various lab procedures. Students are given an unknown bacteria and must identify the unknown using lab methods learned first quarter. Students work individually which requires self-organization, motivation, and systematic reasoning in the identification process. Upon completion of the unknown lab, a typed lab report is submitted containing procedures, review of literature about the identified unknown, summary, and a bibliography. Lab manuals are constructed by each student.

Biology Syllabus - Handouts 191

Allen Jaggi, Science Department Chairperson
Lyman High School
Box 1090
Lyman, Wyoming 82937

Target Population: Grades 9-12

The goal of this biology program is to have students of all abilities be able to understand basic life functions and relate these life functions to their everyday world as well as enjoy the class. I use a syllabus (course outline) for each unit taken mainly from the biology book. This includes the lab experiments, drawings, extra pictures, study guides, extra materials, and the notes. I put the outline on the overhead projector and fill it out while discussing and using the book so everyone sees, hears, and writes. Everyone knows what will happen, what is expected, even when they are not present in class. It especially helps the low-reading level students because it is more structured.

Bones 192

Paul R. Osmer, Science Teacher
Lounsberry Hollow Middle School
Sammis Road, P.O. Box 219
Vernon, New Jersey 07462

Target Population: Grades 7-9

Students are given a disarticulated animal skeleton (i.e., rabbit, cat), placed in small groups, and it is then each group's responsibility to assemble the skeleton properly on a piece of posterboard. The students might also draw a picture of what the animal they believe their skeleton to be, to review other groups' skeletons and compare them to their own, and to examine the composition of various joints and study their differences. The timeline can be anywhere from four to eight days depending on how many of the activities are included in the program.

Bonus Labs 193

Marjorie Arnsdorff, Science Coordinator
Savannah Country Day School
P.O. Box 14256
Savannah, Georgia 31419

Target Population: Grades 6-8

The goal of Bonus Labs is to encourage students to use the process of scientific method to design their own experiments. I have a bonus folder which contains further questions about a concept we studied. After a test or anytime during 15 to 20 minutes of classtime, I announce that bonus work or written homework can be done. I require ten points in my IPS classes per quarter lab book. All other bonus work written in lab procedure is plus points in their lab notebook.

Career-Oriented Modules to Explore Topics in Science (COMETS) 194

Walter Smith, Professor
University of Kansas
205 Bailey Hall
Lawrence, Kansas 66045

Target Population: Grades 5-9

COMETS Science provides over 100 activities organized into 24 modules in over 400 pages. Information about contributions women have made in science is emphasized. Most modules have Challenge Cards outlining open-ended student investigations. Experimentation and hands-on experiences are included in each module. There are computer activities, and many activities allowing students to practice math skills. Also, there is a companion set of 24 biographical Profiles, each featuring a woman pursuing a science career, plus language arts activities such as content quizzes, vocabulary building exercises, and directions for writing and projects. COMETS activities focus on several dozen different topics, so thay can be infused into and enhance general science, life science, physical science, earth science, or math classes.

Carroll County Elementary Training/Coaching Program 195

Gary E. Dunkleberger, Science Supervisor
Carroll County Public Schools
55 North Court Street
Westminster, Maryland 21157

Target Population: Elementary Teachers

The purpose of this inservice program was to train 280 elementary teachers as a new science program was being implemented. Teachers were paid to participate in a series of two-day, grade-level training workshops during the summer. At this time, instruction was targeted at the content of the new program as well as having teachers physically do the lessons they would later be doing with students. Subsequently, implementing teachers were pulled in for two follow-up workshops during the school year. These were problem-solving sessions designed to help people work through difficulties that arise as they implement this program for the first time. Graduate assistants from a nearby university were assigned to work with teachers as coaches who helped with planning, gathering materials, and providing feedback. Outstanding teachers are selected for participation in a two-week, graduate level Honors Workshop that trains them for a leadership role as a building level resource person. These individuals are then brought in during the course of the year for follow-up workshops stressing content and methodologies.

Cato-Meridian Central School's K-6 Program 196

Sandra M. Squires, Elementary Science Coordinator/Teacher
Cato-Meridian Middle School
P.O. Box 100
Cato, New York 13033

Target Population: Grades K-6

This is the second year of a K-6 science program developed from ground zero. There was no elementary curriculum, formal or otherwise, previously in place in the Cato-Meridian School system. The program developed is oriented towards activity-based, critical thinking, and problem-solving. The starting point for our program was the Elementary Science Program (ESP) out of the Monroe 2-Orleans BOCES. It is basically a recompilation of the ESS, SCIS, and SAPA programs. One of the biggest advantages we have seen with this program is its flexibility. They produce units on various topics that can be worked into an existing program or, as in our case, be used as the first step in developing a program tailored to an individual district. In addition, all materials are supplied in well-organized packages, which eliminates a great deal of equipment scavenging as well as storage problems. It is our intention to further develop our science program so that it can be integrated with all existing curriculum areas, particularly the language arts and social sciences.

Combination of Biological Science and Reading in the Biological Sciences 197

Barry Spector, Mathematics/Science Instructional Associate
Valley Stream High School
Fletcher Avenue
Valley Stream, New York 11582

Target Population: Grades 10-12 - Remedial Students

The students enrolled in the Biological Science course are also assigned to a reading program every other day. The reading section makes use of the biology content to teach many of the reading skills with which the students have difficulties. Each lesson in the reading portion contains a content objective and a complimentary skill objective.

We find that using the content area for the teaching and practicing of reading skills provides a systematic approach which supports science instruction. We feel that the teaching of reading as a separate phenomenon is, at best, a poor way of using skills.

Combining Science and Social Studies 198

Carol Ventura, Teacher
Dorothy Moody Elementary School
10101 England
Overland Park, Kansas 66212

Target Population: Grade 6

SAPA II Program is used for teaching modules with modifications in order to provide students with written notes to fill in as observations are made. As each activity is completed, the students work on a social studies assignment to keep them occupied while others in the class finish. Current events in science and social studies are related to each other. Students appear to like both subjects more as they see the relationship to daily events and the use of science and social studies skills in other areas.

Computer Interfacing in Science Labs 199

Wesley L. Knapp, Academic Head for Science
Scotia-Glenville High School
Sacandaga Road
Scotia, New York 12302

Target Population: Grades 7-12

The goal of this practice is to expose students to a use of the microcomputer that they have not seen in our curriculum--interfacing computers directly to an event by connecting directly to the electronics rather than going through software and an operator. The equipment used is an Apple IIe, disk drive, interfaces which allow pH, temperature, time, and mass determination, a top-loading digital balance, and an air track. At this time, approximately ten percent of our science labs interface directly with the computer, and we are increasing this percentage all the time. These interfacing applications open up a whole new dimension to students about the functions and applications of computers.

Computer-Physics Lab/Amateur Radio Station 200

Richard E. Wagner, Science Director
Newburgh Free Academy
201 Fullerton Avenue
Newburgh, New York 12550

Target Population: Grades 11-12

The objectives of the Computer Physics Laboratory are: to establish within each student an appreciation of scientific method and the development of critical thinking; and to provide each student with computer skills including using database techniques for graphing and filing, utilizing computer interfacing for real-time data collection, and using word processing for presentation. Each computer station in the laboratory provides a 128k Apple IIe computer, color monitor, printer, and serial interfacing.

The amateur radio licensing has two components: the ability to send and receive Morse code and the ability to demonstrate an understanding of radio principles and electrical engineering. An amateur radio station was established in the physics laboratory and has equipment that provides Morse code and phone worldwide communications abilities.

Concept of Building Representative **201**

Peggy Teters, Elementary Science Curriculum Supervisor
Springfield Public Schools
940 North Jefferson
Springfield, Missouri 65802

Target Population: Elementary Teachers

The goal of this practice is to eliminate duplication of content area meetings. The elementary teacher is bombarded by inservice meetings and training sessions. The elementary science department developed this unique idea of designating one individual in the building as representative. This has been in practice for three years. The building representative attends workshops, informational meetings and serves on science committees. The information gathered is then disbursed by them at the building level. The network effect has definite impact on our elementary science program.

Controlled Experiments **202**

Alan Breach, Science Chairperson
Lounsberry Hollow Middle School
P.O. Box 219, Sammis Road
Vernon, New Jersey 07462

Target Population: Grades 7-8

The purposes of this practice are: to demonstrate a controlled experiment; to show how a variable can change the result of an experiment; to practice accurate data recording in the form of a scientific log; and to learn growth patterns of a red bean seed. The work is done entirely at home under parental supervision. The parents sign a work contract with the student and teacher. The experiment takes 30 days, and ten days to write the report. The student provides all materials for his/her variable and the teacher provides the seeds. The student records growth patterns of a control and experimental group of seeds over a 30 day period. This practice provides an opportunity for students to complete a true controlled experiment. In addition, it allows a partnership with parent and home which involves all in a scientific process.

Cooperative Group Learning **203**

Kathryn Cunningham, Science Department Chairperson
Prairie Junior High School
11910 South Kostner Avenue
Alsip, Illinois 60658

Target Population: Grades 7-8

Cooperative group learning is based on the idea that students of mixed ability will form a "community type" support network if allowed to work together for any length of time. Cooperative groups may number four to six students of mixed ability. When the members of each group meet, their roles are always assigned by the group: facilitator, recorder, participant(s). The roles of the members rotate. Only the recorder does any writing. For any goal that the group is expected to complete one grade is assigned. All members of the group earn the same grade as a product of the whole. As the group works, the teacher circulates, checking the progress of each group. The teacher may question any member of the group at random. Any student who does not know what is going on or what the group is doing loses credit for the group as a whole. Students within the group are expected to keep each other informed and apprised of what is going on at all times. Slow students are tutored and quick students have the opportunity to reaffirm their skills.

Create-A-Cell Activity **204**

Barbara Blair, Science Teacher
Durango Public Schools
P.O. Box 2467
Durango, Colorado 81302

Target Population: Grades 10-12

The goals of this activity are for students to use imagination and creativity to build imaginary cells. This activity may also be applied to the processes of cellular division. It helps students to retain knowledge about the structure and function of cells using just the major life functions as a starting point--metabolism, respiration, reproduction, digestion, transportation, and secretion. Equipment needed includes white paper, colored pencils, and imagination.

Create-A-Plant **205**

Ann H. Dudley, Science Coordinator
Torey J. Sabatini School
359 Woodland Road
Madison, New Jersey 07940

Target Population: Grade 6

The goals of this practice are: to introduce the scientific method, experimental design, brainstorming, and plants' needs for survival and to introduce steps of scientific method, have class reword steps into questions, and apply method to practical situations. The class plays a game to create questions and then designs experiments that would answer those questions. Brainstorming techniques are introduced to the class and practiced individually, in small groups, and as a class. Students brainstorm a list of what plants need to survive, change items to variables, choose a variable, design and set up an experiment to measure that variable's effect on plant growth for ten days, and share results with the class. Students use an adapted form of OBIS "Invent a Plant" to combine all techniques and information learned. Students are given two conditions and an assortment of items with the task of brainstorming five plant designs, using the materials, that would survive the conditions given. Each group presents their plant to the class, explains the functions of the parts, and defends its ability to survive the conditions.

Creative Physics **206**

Lamar DeMott, Secondary Curriculum Director
Colquitt County High School
1800 Park Avenue
Moultrie, Georgia 31768

Target Population: Grades 9-12

Concerned about the lack of interest in physics at the secondary level, an instructor decided to insert creative ideas into the traditional physics course. These are simple ideas that are carried out with materials such as paper, glue, rubber bands, one volt electric motors, tubing, and other in-town materials. These are activities that are related to topics in physics currently being taught and do not take away time for rigid problem-solving and laboratory experiments. Students are given a topic to research in the library, the problem is discussed, and a plan of action developed. The plan of action usually consists of drawing a diagram, writing out what they are trying to do, listing materials needed, and stating reasons why they may not finish the activity. Upon completion, a competition is held among the groups. All groups are praised for their efforts. Some activities include: rubber powered car (linear kinematics), paper bridge (force vectors), paper cannon (projectile motion), and solar heater (thermodynamics).

Creative Science Teaching on a Low Budget by the National Exemplar in Inquiry 207

Eva Kirkpatrick
National Exemplar in Inquiry
3511 Stonebrook Forest Drive
Imperial, Missouri 63010

Target Population: Grades K-9

The goals of this program are: to aid students in the development of positive attitudes in science; to develop skills in the process of science such as recognizing and identifying problems, stating hypotheses, understanding assumptions, observing carefully, collecting and drawing proper conclusions; to stimulate students through the process of inquiry to collect information and formulate principles relevant to the development of conceptual schemes of science; and to develop students' skills in using the instruments and proper techniques in science. The program provides opportunities for students to design experiments and construct the necessary apparatus and to find, read, and interpret science literature. Students are shown how applications of the basic principles of science have contributed to the intellectual development of mankind and serve an important role in attacking society's problems. In addition, career opportunities are explored in science as well as environmental problems.

Dahlem Center School Program 208

Diane Valen, Program Coordinator
Dahlem Environmental Education Center
7117 South Jackson Road
Jackson, Michigan 49201

Target Population: Grades Pre-K-5

The Dahlem Center is an environmental education center that offers a series of environmental education/science programs to students from preschool to fifth grade. The programs are designed to meet grade-specific science objectives with particular attention focused upon ecological principles. The Center's rationale is that ecological foundations of the natural world, while interesting, have little transferability to the learner's home environment if a connection is not planned. The Center seeks to bridge the gap between natural and built environments through a three-pronged approach: introducing ecological concepts in the built environment; developing the concepts in the natural world; and applying the concepts in the student's home environment. This is accomplished through field trips to the Center, teacher packets of pre-trip and post-trip activity ideas, student handout masters, and other pertinent resources.

Developing Coping and Cognitive Skills through Science 209

Wende Allen, Program Developer
Northeast Region Education Center
Box 1028
Williamston, North Carolina 27892

Target Population: Grades 4-7 - Special Education Students

Developing Coping and Cognitive Skills through Science is a project that uses the discipline of science to improve the cognitive and coping skills of mentally and emotionally handicapped children in grades 4-7. The goal is accomplished by remediating certain cognitive deficiencies in each child and thereby promoting behavioral change in areas of problem-solving, decision making, socialization skills, and locus of control. The program consists of two components: a science curriculum, and appropriate instructional and behavioral management techniques. The curriculum is sequenced and specifically addresses those cognitive deficiencies prevalent in the target population. The activities are multi-sensory, multilevel, and hands-on. Altogether, eight units of instruction have been field-tested in special and regular education classes.

Differentiated Objectives 210

Scott Backer, Science Teacher
Waterville-Elysian High School
500 East Paquin
Waterville, Minnesota 56096

Target Population: Grades 7-8

The goal of this practice is to create a science curriculum to fit the needs, goals, and abilities of individual students. The benefits of this program are to challenge gifted students, allow lower-ability science students to have success, allow all levels of ability to master concepts that match their needs and ability, and help integrate and mainstream students in the special education area with the science curriculum. Also, this system allows the teacher to work with certain concepts that low-level students need help in, while upper-level students go on to other required concepts for their level. The curriculum is developed which separates students into three ability levels. The levels are chosen by the students with some guidance from teachers and parents. Levels may be changed throughout the year to fit the ability of the student. The curriculum includes three levels of the following: concepts, reading, vocabulary, worksheets, assignments, and test questions.

Duxbury Beach Field Ecology Unit/Trip 211

Paul Romano, Science Teacher
Duxbury Intermediate School
Saint George Street
Duxbury, Massachusetts 02332

Target Population: Grade 7

The Duxbury Beach Field Ecology Unit/Trip is a four week intensive study of a barrier beach-estuary-ocean ecosystem with emphasis on people's impact upon the positive and negative effects they directly have upon this vast but delicately balanced system. The unit involves classroom history of beach formation assimilation, equipment building for field work, speaker presentations of environmental impact, and a full field day study with lab follow-up. The student objectives of this unit include: ability to write an essay describing the formation of the beach; ability to describe the ways in which the beach has affected the people of the area; ability to compare and contrast the physical and biological factors of the ocean, dunes, and estuary; and the ability to identify problems resulting from the mismanagement of these zones as well as possible solutions to these problems.

Earth Science for the Real World (ESRW) 212

Thomas P. Knorr, Sr., Earth Science Teacher
Pen Argyl Area Junior High School
501 West Laurel Avenue
Pen Argyl, Pennsylvania 18072

Target Population: Grade 7-12

The ninth grade earth science program is an innovative, well-organized program that is appropriate for all students in preparing them to become responsible, informed citizens ready to interact with the "real world." The program utilizes low-cost, readily available resources and uses the "real world" as a focus rather than a textbook. Student "meteorologists" and "geologists" apply basic concepts using the scientific method to predict the weather, determine the suitability of a landsite area for development, and interpret geologic processes in the field. The dynamic program, with emphasis on the development of thinking skills over memorization, motivates students with numerous, low-cost investigations dealing with timely, relevant concepts and issues such as energy utilization and its conservation which results in high student interest. Activities, in modular form, include independent learning units; numerous computer programs; an exercise to measure the heat output from student-constructed solar collectors; a board game that reinforces weather forecasting principles; and simulated, in-class field trips.

Earth Walk Days **213**

Ira Trollinger, Assistant Superintendent for Instruction
Orange County Schools
200 East King Street
Hillsborough, North Carolina 27278

Target Population: Grade 7

Earth Walk Days is a special two-day event planned by the science faculty at A. L. Stanback Middle School for all seventh grade students. Students are bused each year to the Eno River State Park and are put through a series of mini-lectures in the outdoor setting. This past year, sessions on energy conservation and safety, forestry management, soil conservation, trees, wildlife management, and hunting were featured. Students come away having participated in a fun-filled day with many interesting and informative sessions and having developed a broader understanding and appreciation for the environment.

Ecology - Acting, Creating, Teaching (ECO-ACT) **214**

Dave Wilson, Environmental Education Manager
Missouri Botanical Garden
P.O. Box 299
St. Louis, Missouri 63166

Target Population: Grades 10-12
Elementary Teachers

ECO-ACT is a program that teaches environmental issues and leadership skills to high school students in tenth through twelfth grades. The program is open to secondary students who have satisfactory academic standing and strong leadership potential. ECO-ACT consists of a three-week summer session in which students learn to recognize and define local environmental problems; monthly workshops during the school year where student teams develop a curriculum for teaching various themes related to the environment; and weekly sessions where students actually teach what they have learned to children at the elementary level. The program is sponsored by the Missouri Botanical Garden, and two, full-time educators act as program teachers and leaders.

Ecology Unit 215

Patricia Warren, Science Teacher
Brunswick Junior High School
Barrows Street
Brunswick, Maine 04011

Target Population: Grade 6

Process science is a way of life in the Brunswick Junior High School sixth grade science curriculum. By doing and discovering, students better understand difficult science concepts. Process science is a more difficult method of teaching. The classroom does not stay neat and tidy, the students are not usually in their seats with a textbook, and the teacher becomes a facilitator of activities rather than just having students write the answers to questions. Of particular interest is a unit taught on the important subject of ecology. Sixth grade science teachers have used the process method to teach their students basic ecological concepts. For five weeks students study the area around the school in preparation for an all day field trip. All sixth grade students, teachers, many parents, and high school biology mentors trek into field, forest, ocean, and pond in a five-hour intensive application of the skills of field ecology.

Ecosystems of the Chesapeake Bay 216

James J. Sarnecki, Supervisor
Baltimore City Public Schools/Chesapeake Bay Foundation
Elementary Education Division
1519 Winford Road
Baltimore, Maryland 21239

Target Population: Grades 5-6

In cooperation with the Chesapeake Bay Foundation, a group of students explore various locations of the Patapsco River as it flows into the Chesapeake Bay. A research vessel, The Osprey, is equipped with the equipment for the students to test and analyze water quality of the estuary, such as salenity, dissolved oxygen, pH, temperature and turbidity. Other activities include dredging, navigating, seining for plankton, and plotting a bottom profile. Stresses created by waterside industries, identifying shipping activity in the harbor, and a study of non-marine living things such as birds and plant life are other activities the students investigate during this field trip.

Einstein's Closet 217

Bruce Breeden, Assistant Principal
Carmel Junior High School
300 South Guilford Road
Carmel, Indiana 46032

Target Population: Grades 2-5

This is a four-week program that provides younger students with a wide variety of hands-on activities appropriate for their age level and experience. The class is conducted in the junior high building where equipment from test tubes and petri dishes to compound microscopes is used with the students. The main goal for this two year old program is to provide concrete activities for young students so they will feel more confident and comfortable with science concepts.

Electronic Consortium for Science Improvement 218

Bruce Marganoff, Science Project Coordinator
New Jersey Department of Education
225 West State Street, CN 500
Trenton, New Jersey 08625

Target Population: Secondary Science Teachers

The Consortium is a regional network of computers that are linked together via a telephone network to a host computer at a local college. Electronic communication allows meetings to take place that might otherwise not be possible because of time and distance factors, costs, or other commitments of staff. Via this network, staff members participate in inservices, curriculum development, and program evaluation activities. In addition, this network allows the members, 60 secondary science teachers, to communicate directly with each other relative to their daily work. It also allows them direct access to faculty members at five local colleges who specialize in specific science content areas and serve as resource persons to the teachers.

Elementary School Science Exploratory Laboratory 219

Janet Opaleski, Fourth Grade Teacher
John S. Haitema Elementary School
11870 Eldorado Drive
Sterling Heights, Michigan 48077

Target Population: Grades 1-6

The goals of this program are to develop student interests in the sciences; to have students acquire knowledge in several fields including chemistry, geology, and physical science; to have students develop beginning laboratory skills; to provide opportunities for individual and small group explorations in science fields; and to involve parents in the student's education. A laboratory was established and stocked through voluntary contributions and Parent Teacher Organization funds. An extensive series of science experiments were developed. Small groups of students were scheduled during lab time to conduct experiments under the supervision of volunteer parents on a regular basis.

Elementary Science Coordinator 220

Leon R. Calabrese, Assistant Superintendent
Middletown Area School District
55 West Water Street
Middletown, Pennsylvania 17057

Target Population: Elementary Teachers

For this practice, a master teacher of elementary science is selected to work with other elementary teachers. The goal of the coordinator's position is to improve science instruction at the elementary level and to coordinate equipment and supplies needed for the elementary programs. This model has been used for three years.

Elementary Science Curriculum **221**

Gary E. Dunkleberger, Science Supervisor
Carroll County Public Schools
55 North Court Street
Westminister, Maryland 21157

Target Population: Grades 1-5

This three year old elementary science curriculum is based upon the processes of science as a means of problem-solving. Content covers major topics in both the biological and physical sciences. A direct, hands-on involvement of youngsters is the basis of the program. Although the curriculum does not employ a textbook, it is supported by a wide variety of trade books that supplement the program content. Custom-made science kits provide the instructional materials required by teachers. Comprehensive grade-level curriculum guides structure the material being taught.

Elementary Science Laboratory **222**

Ruth Fennessey, K-6 Science Coordinator
Northbridge Public Schools
W.E. Balmer School
Crescent Street
Whitinsville, Massachusetts 01588

Target Population: Grades 3-6

This academic year we have implemented an elementary science laboratory headed by a laboratory instructor. The laboratory serves all students in grades 3-6. Each classroom has a weekly scheduled lab period. During this lab time, pupils pursue experiments suggested in the text, learn the processes of science, and explore science in current events happenings. The lab activities are coordinated with classroom content. Each science classroom teacher meets with the lab teacher each week. The result is a balanced content and process science program. The program has been in practice since September 1985.

Elementary Science Program (ESP) 223

David R. Babcock, Director
Monroe 2-Orleans BOCES
71 Lyell Avenue
Spencerport, New York 14559

Target Population: Grades Pre-K-6
Special Education Students

The ESP is a support service for teachers to assist them in improving the instruction of elementary science. The professional staff conducts workshops, demonstration lessons, and writes curriculum. The program contains over 152 different unit titles that have been developed into kits. Technical aides build and maintain the kits. The kits are circulated among subscribing districts. The ESP began as a BOCES service in 1972 when two school districts pooled resources to initiate a service to provide inservice training for teachers and production of science kits.

Elementary Science Project 224

Dick McQueen, Science Specialist
Multnomah Education Service District
220 S.E. 102nd Avenue
Portland, Oregon 97216

Target Population: Grades K-6
Elementary Teachers

A study was conducted of the K-6 science programs in all 11 elementary public school districts in Multnomah County during 1982-83. The recommendations of this study that were adopted in 1983-84 by six districts, and in 1984-85 by three more districts were: all K-6 children are to have 30 hours of activity science per year; four or five activity units are to be taught per year; each activity unit supplied by kit of materials; each teacher using a unit (kit) is to receive one hour of practical training before use; all teachers are to teach all prescribed units; all children are to have activity science; teachers experienced in the use of units are to provide training; and participating districts are to share materials and costs of supply system through MESD. The project continues to be directed through a teacher steering committee and participating districts' curriculum supervisors.

Emphasis upon Realistic Application of Science Teaching-Learning 225

Bernard Epstein, Principal
Pattonville Heights Middle School
195 Fee Fee Road
Maryland Heights, Missouri 63043

Target Population: Grade 8

Our eighth grade science teachers make a concentrated effort to relate science teaching and learning to meeting students' everyday needs and interests of daily life. This includes CPR Certification, Hunter Education Certification, Habit Diaries (to prove to students that they can break any habit they really want to), Lunch Room Food Choices, Energy Conservation (in the electricity unit), Naked Eye Recognition of the Nighttime Sky, and checking family inoculations. We also have our own observatory which we share with the community and our planetarium which we use as a hands-on teaching tool for our students. We are taking science out of the textbook and relating it directly to students' lives.

Environmental Education Curriculum 226

Linda L. G. Brown, Science Education Consultant
George M. Houston Memorial Gardens
515 23rd Avenue
Greeley, Colorado 80631

Target Population: Grades 3-4

The study of environmental education can provide a rich opportunity for extending the elementary classroom, as is evident at Houston Gardens in Greeley, Colorado. The curriculum developed capitalizes on the replicated life zones in Colorado, as well as incorporating developmental learning theories and success-based education. It reflects an ecological view that stresses the science of world survival and includes problem-solving aspects of social studies. Currently focusing on third and fourth grades, the project features 14 independent units to be implemented in three phases to maximize elementary students' learning.

Environmental Education Program 227

R. John Paskey, Principal
Lounsberry Hollow Middle School
P.O. Box 219, Sammis Road
Vernon, New Jersey 07462

Target Population: Grade 6

The unique thing about this practice is that an entire class of sixth grade students, numbering over 300, receives science instruction in a natural environment conducive to the curriculum. Students working in hands-on activities find that it is much easier and simpler to learn and understand all scientific concepts. The program includes courses in homesteading crafts such as nature crafts, basketry, candlemaking, and blacksmithing. In addition, students learn about ecology through studies of ponds, forest, fields, rural areas, and streams. These studies focus on energy flow, food webs, tropic levels, population dynamics, and the effects of man on the environment.

Extended Outdoor Environmental Outings 228

Ernest Schiller, Biology Instructor
Central Lee High School
R.R. No. 1
Argyle, Iowa 52619

Target Population: Grades 9-12 - Advanced Students

The four major objectives of this program are to expose advanced biology students: to set up and work in an out-of-doors laboratory; to develop alternatives of present means of entertainment, such as ones which do not consume fossil fuels; to have students develop a community bond on this extended trip; and to utilize students to become peer group leaders in different areas of instruction. On this four day/-three night primitive camping mission, students are exposed to different fields of outdoor biology and environmental studies to both diurnal and nocturnal organisms.

Field Science **229**

Terry Logue, Earth Science Teacher
Natrona County School District No. 1
970 Glenn Road
Casper, Wyoming 82604

Target Population: Grades 10-12

The summer of 1985 will be the 23rd year of Field Science, a summer school course consisting of four days of field trips to local areas of geologic, biologic, and historic interest. Teaching is done as a school bus travels between stops so that students can have hands-on experiences at nine different environments within a thirty mile radius of Casper. Students climb across anticlines, key out plants, hunt fossils, and visit historic sites. Roadlogs, plant keys, field guides, and collecting materials are used. The interrelationships of biology, geology, and man are stressed. The interest and involvement of students in Field Science has led to Science History Loops, Advanced Field Science, a Mobile Museum, local field guides, a braille trail, and other community projects.

Fitchburg Area Collaborative for Excellence in Teaching Science (FACETS) **230**

Stephen Keating, Assistant Principal
Hawthorne Brook Middle School
Brookline and Dudley Roads
P.O. Box 654
Townsend, Massachusetts 01469

Target Population: Grades K-8

The major goal of FACETS is to develop and redefine a comprehensive way of thinking about science, its process and content, in order to objectively determine how science instruction in a K-8 setting could be improved and made more relevant for children. Thirteen area educators involved in the two year project through Fitchburg State College have been meeting weekly for the express purpose of detailing information and refining a common approach for the implementation of a teacher-directed, child-centered, hands-on science method in the immediate geographical area which will better prepare children to understand the world around them in a scientific sense.

FACETS participants hope to become involved in the retraining of teachers in instructional alternatives in science and other academic disciplines in order to assist children in finding information through the thinking process rather than through dissemination of information from the teacher.

Foundational Approaches in Science Teaching (FAST) 231

Frank W. Mattas, Dissemination Director
University of Hawaii
Curriculum Research and Development
1776 University Avenue
Honolulu, Hawaii 96822

Target Population: Grades 6-10

FAST is an interdisciplinary environmental science program which emphasizes foundational concepts and methods of the physical, biological, and earth sciences and relates them to practical issues of human use of the environments. Approximately 60 to 80 percent of class time is spent by students on investigations (hands-on) in the field and laboratory. The FAST Program is organized into three components which are studied concurrently by students in an inquiry/rediscovery approach. The three components are physical science, life science (ecology), and relational study. The equipment and materials used utilizes the "shoe box" approach to maintain low cost. The program was developed over a ten year time frame. It has been field tested on over 350,000 students.

Future Health Professionals Network 232

Marie F. Kaigler, Mathematics Supervisor
New Orleans Public Schools
1815 St. Claude Avenue
New Orleans, Louisiana 70116

Target Population: Grades 6-12 - Minority Students

The Future Health Professionals Network's purpose is the early identification of minority students who have the interest and ability to pursue careers as physicians or other health professionals. The program is sponsored by the Louisiana State University Medical Center. It will provide opportunities for academically talented students in math and science to interact with renowned scientists and acquire research laboratory experiences.

Geology - Advanced Honors 233

Richard E. Wagner, Science Director
Newburgh Free Academy
201 Fullerton Avenue
Newburgh, New York 12550

Target Population: Grades 11-12

Aspects of college level physical geology, including college historical geology and much regional geology that focuses on the Mid-Hudson Valley, are not usually taught to high school students. Our students this year will be able to take the CPEP college test in physical geology which is produced by the University of the State of New York. The students spend about one week on field-microscope identification ois produced by the University of the State of New York. The students spend about one week on field-microscope identification ois produced by the University of the State of New York. The students spend about one week on field-microscope identification oime is spent learning the standard mineral identification procedures. Students thoroughly learn to use topographic maps through the use of more than 30 different maps during the year. This year we plan to integrate a laser disk audio-visual player with an Apple computer setup to study the landform features of the earth's surface.

Goodnight Science Lab Program 234

Patti Martin, Science Department Chairperson
Goodnight Junior High School
607 Peter Garza Lane
San Marcos, Texas 78666

Target Population: Grades 7-8

The Owen Goodnight Science Program provides a laboratory approach to the study of earth and life science for the seventh and eigth grade students. The program is designed to give students hands-on experiences with the scientific methods. Laboratory activities are written to include the skills of observing, measuring, inferring, predicting, interpreting data, controlling variables, and experimenting. To teach these skills, a variety of materials and activititing, interpreting data, controlling variables, and experimenting. To teach these skills, a variety of materials and activities are used including experiments, demonstrations, and lectures. Students participate in the science laboratory every sixth school day; this ensures participation in 27 laboratory experiments during the seventh and eighth grade.

Grandteacher Program 235

Larry McGowan, Grandteacher
Marlborough Public Schools
Bolton Street
Marlborough, Massachusetts 01752

Target Population: Grades 2-5

In September 1985, a retired high school science teacher was appointed part-time consultant and resource person for second and fifth grade teachers and students--it is called the "Grandfather Program." The goals are to reduce the anxiety of teachers who do not feel comfortable with science lessons by providing them with examples, help, and support; and to increase the exposure of the children to science activities and experiences. The "Grandteacher" is not an evaluator, but a treasury of experience in science teaching made available to the students and teachers in a non-threatening atmosphere. He is conducting a series of inservice workshops for the teachers and visits 29 classrooms in five elementary schools for monthly science lessons of the lively, hands-on variety using simple, inexpensive materials.

Hands-On Experiences 236

Lee Skallerud, Elementary Science Teacher
Atkinson Elementary School
310 5th Street, S.E.
Barnesville, Minnesota 56514

Target Population: Grades K-6

The goal of this practice is to increase the students' desire to learn about science and retain that desire as they enter high school. We set as a minimum for each grade, one hands-on unit of two to four weeks for the year. Everyone teaching science was able to choose from 15 units that were prepared the summer before. The students become actively involved in the science lessons. This makes the work process-oriented and allows the students to predict and learn from trial and error.

Have a Healthy Heart 237

Sherry Avena, Developer
Model Classrooms, Inc.
4095 173rd Place, S.E.
Bellevue, Washington 98008

Target Population: Grades 4-8

Have a Healthy Heart is a heart health education program with two major components: a heart health curriculum and an aerobic fitness program. Students learn and practice heart health habits they can use for life to help reduce their risk of heart disease. Teachers receive a complete heart health curriculum that is easy and convenient to use. The program can be implemented in regular classrooms or during science or health periods. Students progress through Have a Healthy Heart's Fitness and Lifestyle materials and also implement activities in an aerobic fitness program. Lasting two to three months, the program usually takes one to two hours per week.

Health Survival Class 238

Carol Hill, K-12 Curriculum Director
Apache Junction Junior High School
P.O. Box 879
Apache Junction, Arizona 85220

Target Population: Grade 8

The eighth grade course curriculum was developed in 1983 by John F. Allanson in collaboration with Jay Mitchell, veteran teacher at AJJHS, in an attempt to try new ways to teach personality skills and reduce high-risk health behaviors at an age where people can be positively affected.

Topics in part one of the nine-week course are stress management, peer pressure, decision-making, self-esteem, and locus of control. Some physical skills the students are pretested on are: body balance, reaction time, grip strength, and lung volume. Throughout the course they are given the opportunity to practice these skills, competing only with themselves to improve on post-tests. Part two covers nutrition, fitness, substance abuse, and motor vehicle safety. In part three, the students learn about quackery (health fraud), how and when to call a doctor, and self-care of common ailments such as a cold. The content focuses on both the short-term and the long-range benefits and values received from maintaining healthy lifestyles.

Honors Seminar: "Building Tomorrow" 239

Vicki Clark, Program Specialist
Mathematics and Science Center
2401 Hartman Street
Richmond, Virginia 23223

Target Population: Grade 8 - Gifted Students

The honors seminar for gifted students has been in operation since 1967. The goal of the program is to provide interdisciplinary experiences with an emphasis on scientific topics for students from five different school systems, bringing them together after school. The "Building Tomorrow" program involved 20 eighth graders. They researched, designed, and built models of futuristic human habitats in the environment of their choice (space, underwater, underground, etc.). Instructors were two science instructors from the Center and an architect from the community. Students used a variety of techniques in developing their projects including library research, written reports, interaction with an architect, script writing, model building, and videotaping.

Illustrated Essays 240

Gregory Baran, Principal
Garwood Middle School
4967 Garwood
Fairview, Pennsylvania 16415

Target Population: Grade 8

The goal of this practice is to make the students aware of interesting characteristics and uses of the elements by incorporating library materials, art, and language arts. The students will research an assigned element for basic facts; and the students will research a particular aspect of that element in a scientific journal for timely information. For example, the element silicon could be futher researched as to its use in microcomputer chips or heat shield tiles on the space shuttle. This particular aspect is to be the main topic for a one-page essay on the element. It is also the theme for the illustration that is to accompany the essay. Students present their essay orally and use the illustration to help them. Others in the class are required to chart facts about each element presented.

Imprint of the Amerindian in the Connecticut River Valley-- Archeology: An Anthropological Seminar 241

Cynthia Field, Science Teacher
Timothy Edwards Middle School
100 Arnold Way
South Windsor, Connecticut 06074

Target Population: Grades 6-12

The goals of this program are for students: to recognize geological material; to participate in an anthropological study of prehistoric inhabitants of the Connecticut River Valley; to learn about the lives of the colonial people in the Connecticut River Valley; to experience the discipline of an archaeologist; to experience another viable, successful pattern of living by planning, designing, and constructing an encampment; and to benefit from working cooperatively to achieve these goals. The students are provided with background information in the classroom by teachers, local historians, and amateur archaeologists. Structured activities are planned at a local museum and at an archaeological dig site, enabling students to apply learned classroom material.

Improving Teacher's Knowledge of and Ability to Teach Science-Society Issues 242

Vicki Clark, Program Specialist
Mathematics and Science Center
2401 Hartman Street
Richmond, Virginia 23223

Target Population: Elementary and Secondary Science Teachers

The program goals are to improve the ability of secondary teachers to identify key components of selected science-society issues (i.e., bioethics, land use, effects of technology) and to utilize a developmental curriculum model ("Preparing for Tomorrow's World," from Sopris West, Inc.) to design and teach lessons on science-society issues. The audience consists of teachers from five school systems. Training is being done through a series of inservice classes and demonstration teaching sessions.

In the Name of Science Award 243

Frank B. Lojko, Secondary Science Curriculum Supervisor
Springfield Public Schools
940 North Jefferson Avenue
Springfield, Missouri 65802

Target Population: Science Teachers
School Personnel

The "In the Name of Science Award" was developed to enhance and recognize outstanding individuals in the field of science for their accomplishments to science education. This program was developed in the 1984-85 academic year to promote excellence in education. The "In the Name of Science Award" recipient must be nominated by his or her peers and/or administrator. The applications of nominees are submitted to the "In the Name of Science Award" Committee. The recipients of the award receive a certificate and recognition for their service and accomplishments in the field of science education. The award is solely designed to give immediate and positive reinforcement to worthy individuals who have made an unique contribution, large or small, to science education. In addition, the program has brought about mutual involvement with the teachers, principals, and administrators to evaluate teacher performance and recognize outstanding service to science.

Individualized Science Teaching 244

Richard Schmahl, Science Coordinator
Massapequa High School
4925 Merrick Road
Massapequa, New York 11758

Target Population: Grades 10-12

This practice involves the use of individual, computer generated tests for five years in Physics, and two years in some Biology classes. Each test covers identical concepts using similar questions in random order and with answers in random positions. The program for entering questions and for generating randomized tests was developed by teachers in the district and was in use before commercial products became available.

Instructional and Evaluative Videotapes for the Science Classroom 245

Anthony P. Almen, Elementary Science Chairperson
Hopkins Independent School District 270
1001 State Highway 7
Hopkins, Minnesota 55343

Target Population: Grades K-6

The goals of the project were to increase student access to high quality educational experiences and to develop a product that is helpful and useful to students, teachers, and the community. The project began two years ago when all members of the elementary science committee (building curriculum leaders) received training in video production. They have produced and will continue to produce videotapes which present single-theme lessons on special topics. All of the tapes feature students working with the district naturalist in observing, experimenting, and discussing the topic.

Intermediate Grade Laboratory Science Program 246

Dick Clark, Science Curriculum Specialist
Washington School District
8610 North 19th Street
Phoenix, Arizona 85021

Target Population: Grades 4-6

The purpose of this project was to provide lab facilities for all fourth through sixth grade students; to staff the science program with specially trained science teachers; to unify the program with a district science scope-and-sequence; to assess the program implementation by using science assessment and pacing guide; and to develop a district laboratory handbook identifying minimal instruction. Each school contains a minimum of one science laboratory. Each school selected its most capable teacher(s) to teach all of the 4-6 science. Each teacher must use the science laboratory for at least 50 percent of the time. Through the use of the Science Assessment and Pacing Guide for content and laboratory science, a balance is provided in the curriculum between content and student activities. The student laboratory manual contains 70 activities for each grade level.

Invertebrate Unit 247

Jean Westbrook, Principal
R.H. Fulmer Middle School
1614 Walterboro Street
West Columbia, South Carolina 29169

Target Population: Grades 7-8

The goal of this program is for seventh grade students in life science to be able to identify characteristics of invertebrate phylum and examples. The methods include introduction of the unit by the teacher and a reading guide and activity guide which is given to each student. Learning stations include audio-visuals such as filmstrips on specific phyla, filmloop on insect camouflage, and student-made learning centers. To help students learn phyla, each student brought a "critter box" with a drawing, picture, or constructed animal in a specific phylum. The student researched the phylum. On the outside of the box, hints were given--characteristics of the animal and phylum. Students copied the characteristics, decided on an answer, and checked the answer by opening the box. The boxes were placed in a big bag. Another class published an animal newspaper.

Iowa 4-9 Science Project 248

George Magrane, Science Consultant
Southern Prairie AEA 15
Route 5, Box 55
Ottumwa, Iowa 52501

Target Population: Science Teachers

This project is designed to improve the background and skills of teachers in grades 4-9 through effective use of a proven science curriculum, the use of technology, sound educational theory, and practical application-oriented activities. The project provides inservice for teachers to explore a variety of activities, teaching strategies, teacher guides, and communication networks being developed by a peer group of exemplary teachers. The materials are intended to supplement popular texts with stress on balance of process skills, basic knowledge, and the application of science. The major outcomes of the workshops are: increased capability of science teachers to deliver appropriate grade level experiences for students with an emphasis upon scientific reasoning and the establishment of an interactive telecommunications network as an alternative delivery system for refining curriculum materials, managing scientific data, and providing a large data bank of materials and resources for science teachers.

Junior High Science Guideline Standards 249

Frank B. Lojko, Secondary Science Curriculum Supervisor
Springfield Public Schools
940 North Jefferson Avenue
Springfield, Missouri 65802

Target Population: Grades 6-9
Science Teachers

In the 1984-85 academic school year, two special science committees were established with representatives from each of the eight junior high schools. The goal of the committees was to develop a district-wide Science Standards Guideline which would include the following: uniform guidelines for laboratory/classroom facilities; minimum standards for specified and quantity of science equipment; and minimum standards for supplies, living materials, and ancillary materials. The standards were established to enhance curricula and science programs of the life and physical science classes.

Junior School Science Curriculum 250

Ann H. Dudley, Science Coordinator
Madison Junior School
160 Main Street
Madison, New Jersey 07940

Target Population: Grades 7-8

The goals of this curriculum are to expose junior school students to a diversity of science topics in as much depth as possible so that students may intelligently choose which sciences to pursue in high school, to give them sufficient knowledge in those areas which they do not wish to study further, to make the best use of the expertise of staff, and to insure a coordinated skills base for entrance to high school. Seventh grade students study one-half year of Life Science, including drug education and family life with one teacher, and then take one-half year of Environmental Science with a second science teacher. As eighth graders, students study family life and drug education and an introductory chemistry course for half of the year. They switch to a fourth teacher for more advanced chemistry and physics, primarily optics, for the remaining half of the year.

Junior Year Physics **251**

Richard Schmahl, Science Coordinator
Massapequa High School
4925 Merrick Road
Massapequa, New York 11758

Target Population: Grades 10-12

In this school district, physics has been taught prior to chemistry for the last 30 years. Most schools teach chemistry first and have a much lower percentage of students taking Physics in the last year. Our enrollment in Physics and Chemistry is higher in percentage than the national average and the average grade on the N.Y. State Regents exams are well above the norm.

K-8 Science Coordinator **252**

Ann H. Dudley, Science Coordinator
Madison Public Schools
359 Woodland Road
Madison, New Jersey 07940

Target Population: Grades K-8

The goal of this practice is to employ a full-time science coordinator to increase K-8 student achievement in science. The coordinator is expected to increase the number of hands-on activities, to revise and coordinate the elementary science curriculum throughout the district, to inventory supplies to develop science activity kits available through a central warehouse, and to involve teachers in workshops, conferences, and inservice training. This position was created for the 1985-86 school year.

Life Science **253**

Bill Arendt, Teacher
Franklin Middle School
210 South Franklin Street
Shawano, Wisconsin 54166

Target Population: Grade 7

In dealing with middle school children, the goal of my class is simple and one. I hope to ignite the spark so some of my students feel as an eminent biologist does when he describes the subject of biology--"All those living things: more than a million described species, from bacterium to blue whale, with one heck of a lot of beetles in between, each with its own beauty, and each with a story to tell." Methods revolve around weekly work projects with a variety of different classroom activities and follow-up homework assignments. I have included five different weekly projects. Materials vary from living things to videotapes. No text is used! They are inadequate because they fail at weaving together the three theories which best explain living things--the cell, genetics, and evolution.

Loma Vista Farm and Garden Center **254**

Thom Arcadi, Project Director
Vallejo City Unified School District
101 Cobb Avenue
Vallejo, California 94589

Target Population: Grades 1-6
Special Education Students

This is a thriving school-community project that offers a multitude of teaching and learning opportunities for students and adults. The facilities of the farm are used to teach students in an active manner; students "learn-by-doing." They use their experiences at the farm to better understand concepts related to reading, math, communication skills, problem-solving skills, and especially human relations skills. Motivation is high at the farm when students must learn to read to interpret directions on feed and seed packets, or when they must learn math to weigh and measure livestock, or when they must learn to spell and write to compile notebooks or diaries of their observations. Students see the practical need of learning tharn to spell and write to compile notebooks or diaries of their observations. Students see the practical need of learning tharn to spell and write to compile notebooks or diaries of their observations. Students see the practical need of learning the subjects taught in school.

Marine Science Project: FOR SEA 255

Margaret Philbrick, Developer/Demonstrator
Marine Science Center
17771 Fjord Drive, N.E.
Poulsbo, Washington 98370

Target Population: Elementary and Secondary Teachers

Marine Science Project: FOR SEA is a unique curriculum package dedicated to marine science education. Our goal is to provide students with a first-hand experiential understanding of the vast water realm and its resources, whether students live on the coast or inland. Close proximity to seawater is not a requirement for successful hands-on marine education using materials for activities readily available through grocery or variety stores. The project curriculum unifies biological, geological, chemical, and physical science concepts through an exciting introduction to all aspects of the world of water. The project has successfully provided training for elementary and secondary teachers for implementation either as a science course or as a supplement of an existing science program. The project received national validation through the Joint Dissemination Review Panel of the U.S. Department of Education in 1982, following extensive evaluation as to its effectiveness since its development in 1978. The project is currently being funded through the National Diffusion Network.

Mastery Learning Science Units 256

Paul Moser, Principal
Ayer Elementary School/Forest Hills School District
8471 Forest Road
Cincinnati, Ohio 45230

Target Population: Grade 2

Mrs. Wilson's goal in science is to make sure all students learn all the objectives of the program. This is accomplished by assessing and validating student learning. The methodology varies from whole group to individualized instruction. When writing objectives, she consciously includes objectives that measure concepts, information, and processes. Students are checked throughout the unit to validate that they have mastered the objectives taught before moving on to new material. Extra time is provided for students who need more time to learn. Students who learn quickly receive independent learning activities. Her room is "alive" with excitement. There are always learning centers, activity corners, and experimental learning activities. Mrs. Wilson knows how students learn and plans her science units accordingly. She realizes that the instructional process can be changed to improve learning. Mrs. Wilson spends hours in the pre-planning stage in order to insure that she will be well-prepared with objectives and appropriate instructional materials.

Meaningful Elementary Science 257

Thomas W. Rabone, Principal
Maple Hill Middle School
1477 South Schodack Road
Castleton, New York 12033

Target Population: Grades 5-6

Elementary science at Maple Hill Middle School is a problem-solving, hands-on approach. We believe that the students should experience meaningful science that allows the individual to incorporate their own previous experiences. Students have the opportunity to brainstorm and determine questions or problems they would like to solve. Students describe their activities to their classmates. Where possible data is collected and utilized in other classes. The materials and equipment are simple (by design) and easily obtainable.

Meterological - Weather 258

Art DiBenedetto, Principal
Rolling Hills Primary School
P.O. Box 769, Sammis Road
Vernon, New Jersey 07462

Target Population: Grade 4

The goals of this practice are to understand the effects of weather on travel; to understand the effect of clouds on weather; to explain and identify instruments used in weather forecasting; and to observe and record data on the weather station. The practice takes into account the students own experiences and interests. Materials used with students include readings, definitions, illustrations, filmstrips, and a weather station in the classroom. Children take turns working in pairs to measure, record, and predict weather for the remainder of the school year. Data is recorded daily on a classroom physical weather station chart--temperature, barometer, humidity, and cloud kinds.

Mobile Energy Laboratory (MEL) 259

William R. Einsig, Science Advisor
West Shore School District
1000 Hummel Avenue
Lemoyne, Pennsylvania 17043

Target Population: Grades 3-8

MEL is the focal point of West Shore's energy education program. Students in grades 3-8 participate in planned energy education programs during each school year. Locally-developed materials and learning stations are used on-board MEL--the district's Traveling Laboratory--to learn about energy conservation. MEL is a remodeled school bus changed into a mobile classroom/laboratory. It travels to the 15 school buildings in the district and connects to electrical and water supplies at each building. Instead of transporting students, we bring the classroom to the students.

Mobile Science Laboratory - Summer Science Program 260

Terrance Moriarty, Principal
Southwest Junior High School/Albert Lea District No. 241
South Highway 69
Albert Lea, Minnesota 56007

Target Population: Grades K-11

The program was started to give the district's students the opportunity to expand their science and math skills in the field. The program focuses on ecology, environmental studies, biology, earth science, camping skills, and good citizenship. The program involves students from K-11 and is divided into elementary and secondary curriculums. The elementary students use the facilities during the school year and the 7-11 students use them in the summer. Both programs are centered around two mobile units made from two semi-trailers which have been built into complete science classrooms--sinks, gas, water, lights, counters, library, and countless pieces of science equipment. These mobile labs are pulled to each elementary school and to the summer sites on an arranged schedule. Two elementary science teachers travel with the labs during the school year.

Nature's Classroom - A Living and Learning Experience **261**

John Santos, Executive Director
Nature's Classroom, Inc.
RFD No. 1, Box 410
Southbridge, Massachusetts 01550

Target Population: Grades 4-8

Nature's Classroom is a non-profit, multi-disciplinary residential teaching service. The development of this program was based upon a framework of social science education which is closely related with that of environmental education. Community awareness and cognition were identified as the prime aims of the Nature's Classroom program. Children are taken from their normal home/school community and put into a total living/learning experience for five days. The academic day is split in half. Each morning the student is introduced to the concept of dynamic equilibrium in the natural world, in social interactions and within himself. Through a process of carefully guided observations delicately controlled by our instructors, students find success in their abilities to hypothesize, scientifically test, and draw subsequent conclusions. The afternoon classes emphasize motivational learning and utilize the out-of-doors to present activities which require cognition. Students are given a choice of various academic classes in which individual and group projects are undertaken.

NEC Elementary Teacher Science Retraining Project **262**

Fredric H. Tarnow, Project Coordinator
Northwest Educational Cooperative
500 South Dwyer Avenue
Arlington Heights, Illinois 60005

Target Population: Elementary Teachers

In response to a needs assessment conducted in the spring of 1984, an inservice training program was implemented during the fall of 1985. This science inservice program will consist of 18 to 22 science retraining seminars. The seminars themselves are tightly focused around rather narrow science topics. Each seminar involves fifteen hours of direct instruction by a team of two seminar leaders. These seminar leaders are selected from among the most knowledgeable and successful elementary, junior high, and high school science teachers in the area. To date, eight seminars have been conducted with 14 more on the drawing board for spring.

Newton Public Schools Elementary Science Program **263**

Betty Holderread, Science Consultant
Newton Elementary/Junior High School
Box 307, 24 West 7th
Newton, Kansas 67114

Target Population: Grades K-6

The Newton Science Program has been developed to provide every student with an opportunity to be involved with science by using hands-on materials. The program involves all children at their level. It is a program that is used to integrate all subject areas. The course is not taught in isolation but it has a sequence that provides students with information about science that they can use for the rest of their lives. The program has been ongoing for ten years.

Oceanic Education Activities for Great Lakes Schools **264**

Victor Mayer, Principal Investigator
College of Education
Ohio State University
059 Ramseyer Hall, 29 West Woodruff
Columbus, Ohio 43210

Target Population: Grades 5-9

Oceanic Education Activities for Great Lakes Schools (OEAGLS) is an interdisciplinary science program for intermediate students in grades 5-9. The project is designed to create a better understanding of the ocean and Great Lakes environments and how these environments impact upon the lives of people. Environmental themes are presented through an infusion process. Concepts from the existing curriculum are developed in an oceanic or Great Lakes context. Areas of study include: the effects of the Great Lakes on temperature and climate, coastal processes and erosion, pollution, shipping, and geography. Twenty-three curricular modules are available to facilitate integration into existing curricula. Modules can be combined to form units of study.

Paper Airplane Flyoff Competition **265**

Doug Kuban, Junior High Science Teacher
Pecatonica Grade School
Reed Street
Pecatonica, Illinois 61063

Target Population: Grades 7-8

Using scrap paper, students design and fold paper airplanes, and compete in a double elimination flyoff. This practice is a hands-on approach to study Bernoulli's Principle, forces involved in flight, parts and control of an airplane, aerodynamic design, and experimentation with variables. It allows for maximum throwing chances, stimulates enthusiasm, and builds drama and suspense. Stopwatch (to time maximum flight duration), whistle, and tournament brackets are needed. This practice has been in use for four years.

Peer Science Teaching **266**

Rose G. Grabelsky, Science Consultant/Teacher
Lakeville School
47-27 Jayson Avenue
Great Neck, New York 11020

Target Population: K-5

A group of fifth grade students (17) interested in science work weekly (one hour) with two high school mentors. Projects developed in this group are then shared with the rest of the school population. Two or three of the fifth graders "take over" during a regular science class period and are the teachers. They present reports, explain their projects, and involve the classes by having printed material for them in the form of word finds, crossword puzzles, vocabulary and matching games. The entire school gets the opportunity to hear them. For example, a project on Halley's Comet included explanatory posters, an illuminated model, and booklets containing pertinent information.

Physics Resources and Instructional Strategies for Motivating Students (PRISMS) 267

Roy Unruh, Physics and Science Education Professor
Iowa Academy of Science
University of Northern Iowa
Cedar Falls, Iowa 50614

Target Population: Grades 9-12

The PRISMS project is a science program that aims to stimulate students' problem-solving skills and enhance their understanding of major physics concepts. The project's primary component is a teacher's guide that incorporates strategies advocated by the Science Teaching and Development of Reasoning Physics workshop of the Lawrence Hall of Science, Berkeley, CA. The theoretical bases for these strategies are the learning theories of Jean Piaget. University staff have coordinated an experimental program which include teacher training in exploratory activities, concept development and stimulation of problem-solving skills; the use of laboratory, videotapes and computers as teaching aids; and instructional telephone conferences between university faculty, teachers, and students.

Physics Sequence - Multilevel Physics Program 268

Larry Hall, Science Instructional Supervisor
Henry M. Gunn Senior High School
Palo Alto Unified School District
780 Arastradero Road
Palo Alto, California 94306

Target Population: Grades 11-12

Physics Sequence is a multilevel physics program that provides three complete courses: a) an advanced placement course for students with high ability in math who are considering careers in science, engineering, and math; b) a middle level course for students comfortable in math but not intending to pursue careers in science or math; and c) a lower level course that covers the basic principles of physics, but in a qualitative sense. The program appears to emphasize a specific teaching approach that includes: teaching in a qualitative manner, stressing inquiry and recognition of principles rather than mathematical problems; teaching for transfer, assignments encourage students to report and analyze the application of learned concepts; positive grades and immediate reinforcement; laboratories emphasize creativity; and principles of physics are presented in micro-units and are repeated until new applications arise.

Physics Teach to Learn 269

Mary Ann Sesma, Assistant Principal
Bell High School - LAUSD
4328 Bell Avenue
Bell, California 90201

Target Population: Grades 10-12

The Physics Teach to Learn project is a highly ambitious undertaking which seeks to use the computer as an interactive demonstration tool. Six Physics teachers in the Los Angeles School District played a major role in developing what will eventually be fifteen modules covering major areas within the physics curriculum. Significant improvement in instruction is realized by the use of these computer modules as an adjunct to traditional teaching techniques.

Process Approach Elementary Science 270

Linda Robertson, Assistant Superintendent
Aurora City Schools
102 East Garfield Road
Aurora, Ohio 44202

Target Population: Grades K-5

Currently, Aurora City Schools is in the process of designing a process-approach, laboratory elementary science program which will incorporate science, technology, and society themes into individual units of study for grades K-5. We plan to incorporate as many local resources such as Sea World, into our instruction. We currently are piloting SCIS II and ESS materials and have used SAPA II for the past ten years.

Process Approach to Science through Discovery **271**

Glenn W. Schwede, Principal
Franklin Elementary School
1509 Fifth Street
Wausau, Wisconsin 54401

Target Population: Grade 2

For the past five years, I have been teaching science to approximately 70 second graders with the use of SCIS (Science Curriculum Improvement Study), ESS (Elementary Science Study), and units that I have developed covering both the physical and life sciences as well as an extensive aerospace education unit. My philosophy about the teaching of science at the elementary level is that students learn best by "doing" rather than reading "about." My methods include as many hands-on experiences as possible and record keeping with the use of a written journal of experiments and experiences in which students record and make drawings of discoveries and observations they have made through their own experiments.

Project Life Lab **272**

Wendy Feltham, Director
Friends of the Harvest
809 Bay Avenue
Capitola, California 95010

Target Population: Grades 3-5

After several years of development under Title IV-C funding (1979-82), Project Life Lab has evolved into a garden-based science and nutrition curriculum which has both outdoor laboratory and in-classroom approaches to instruction. The curriculum is designed for grades 3-5, and has impact in the following areas: students' knowledge of science concepts; students' knowledge of nutrition concepts; and students' reference skills (i.e., inquiry, record keeping, and associated skills). As a state validated program and 1982 NSTA exemplar project, Life Lab has adoptions in ten schools in five different districts in California.

Project Oceanology 273

Howard Weiss, Director
Interdistrict Committee for Project Oceanology
Avery Point
Groton, Connecticut 06340

Target Population: Grades K-College

Project Oceanology is a marine education center operated by a non-profit association of public and private schools. The center provides a variety of instructional resources to enable students, teachers, and concerned citizens to learn about the ocean environment through direct on-the-water experiences. Project resources include a research vessel, oceanographic equipment, a waterfront laboratory, and a trained staff of marine educators and technicians. The following student programs are available: a) School Hours Sessions wherein junior and senior high school classes travel to the project for on-the-water programs, topics include oceanography, marine ecology, fisheries, maritime history, environmental impact, and coastal management; b) After School Programs are available for 30 students each semester (students work as a team on research projects involving oceanography, marine biology, aquarium studies, and coastal ecology); and c) Summer Programs wherein students, divided into small research teams, carry out interdisciplinary studies of marine environment.

Project PAST 274

Nan Munsell, Director
1821 12th West
Seattle, Washington 98119

Target Population: Grades 6-8

Project PAST is an archeology curriculum designed to teach archeological knowledge and concepts to middle school children. The core activities of the curriculum involve 70 hours of instruction which can be taught over a school quarter or expanded over an entire semester. Materials include: teacher activity guides, student books, filmstrips, "Artifakes," games, maps, and equipment.

Project Polar Region 275

Sid Sitkoff, Director
Los Angeles Unified School District
450 North Grand Avenue
Los Angeles, Calfornia 90012

Target Population: Grades 5-8

Project Polar Region is a science program for middle school students (grades 5-8) of all ability levels. It is intended to motivate students to learn earth sciences, polar atmospheric sciences, meteorology, ocean sciences, biology, and resource sciences. The project curriculum consists of four major units: Climatology, Oceanology, Land, and Discovery/Development. The curriculum approach is interdisciplinary, and includes the study of geography, social sciences, and math as well as science. Students are involved in laboratory investigations as well as teacher demonstrations and presentations. A major objective of the program is to guide students into learning experiences that will lead to concept development. Another aim is to emphasize scientific concepts that are crucial to the preservation of the environment.

Project Science 276

Beth Ruocco, Science Coordinator
Stamford Public Schools
195 Hillandale Avenue
Stamford, Connecticut

Target Population: Middle School Teachers

Engineers from CBS Technology Center were teamed with outstanding high school teachers to provide 35 hours of inservice training in physical science areas for 25 middle school teachers. Five eight-hour sessions on light, sound, astronomy, electricity, and magnetism were co-presented by the CBS staff and high school teachers.

Project STARWALK 277

Bob Riddle, Director
Lakeview Museum Planetarium
1125 West Lake Avenue
Peoria, Illinois 61614

Target Population: Grades 3-5

Project STARWALK is a cooperative science program between elementary schools and a local planetarium. The planetarium serves as a facility for providing lab instruction in the area of earth/space science. A process approach is used in observing, graphing, and predicting basic earth science concepts (earth's rotation, revolution, and axial tilt). The planetarium is used as an instrument to display models in order to help the students understand the concept. Students receive a series of lessons structured around three visits to the planetarium to prepare them for their lab activities at the planetarium. These pre- and post-classroom activities are designed to consolidate and further the learning after the planetarium visit. Students in third grade are introduced to the concepts of rotation, revolution, time, and stars and constellations of our galaxy. Students in fifth grade study earth's rotation, revolution, and axial tilt as factors affecting seasons, and stars and constellations of our galaxy.

Project WIZE: Wildlife Inquiry through Zoo Education 278

Annette Berkovits, Curator of Education
New York Zoological Society
185 Street & Southern Boulevard
Bronx, New York 10460

Target Population: Grades 6-8

Project WIZE is a life science curriculum that focuses on survival of individuals, populations, and whole communities. The WIZE program weaves animal ecology, geography, mathematics, social studies, and language skills into the fabric of one course of study. WIZE is the first nationally available curriculum that: a) uses the unique resources of zoos and aquariums to enhance life science, and b) puts into the students' hands an array of innovative materials which challenge and excite students to observe, to evaluate, and to solve problems. Students work individually, in small groups, and as a class on various lesson activities. WIZE consists of nearly 50 lessons, organized into two modules of three units each. Each module is presented via a classroom kit of printed materials such as Discovery Cards, Photo Cards, a Student Resource Book, and a Teacher's Manual with complete lesson plans and worksheets. The second module includes a filmstrip and a simulation game. Each kit contains materials for 12-15 weeks of classroom work and three field trips.

Promoting Excellence in Elementary Science Teaching 279

Myra Neuwirth, Principal
Bellmore Union Free School District
Winthrop Avenue
Bellmore, New York 11710

Target Population: Elementary Teachers

The goal of this practice was to involve classroom teachers (K-6) in a hands-on approach utilizing the three stages of problem-solving in science (observation, invention, discovery) in order to improve science instruction in the classroom. Through teacher-run workshops throughout the 1985-86 school year, participants work as children in small groups using the laboratory approach which places great stress on the actual manipulating of materials and experimenting by each child. Emphasis is also placed on developing teacher's question-asking. Questions are used to stimulate thinking and start discussions, to evaluate what children have learned, and to determine what they are thinking about. The teacher facilitators developed these competencies by attending classes at Hofstra University under a grant provided by the National Science Foundation and are monetarily compensated for running the school workshops under a grant to the school district from EESA Title II.

Reading Instruction: A Successful Strategy in Teaching Science 280

Philip Hershey, Science Teacher
William Penn High School
713 East Basin Road
New Castle, Delaware 19720

Target Population: Grades 7-12

The "treatment" provided in this science program is the use of content reading procedures as a method of instruction for teaching biology course content. The Reading Instruction teacher conveys the biology content by instructing students on how to learn from the textbook. Moreover, the new science vocabulary that students encounter is approached as a thinking strategy, so students can draw reasonable conclusions from their text in much the same way as they work on reading comprehension. In addition, study skills such as effective listening, finding the main idea in a speech, note taking and reference skills were taught using biology material.

Regrouping and Team Teaching 281

Marie Rhatigan-Carroll, Mathematics Chairperson
Albert Leonard Junior High School
25 Gerada Lane
New Rochelle, New York 10804

Target Population: Grades 7-8

Seventh grade science instruction for the past three years uses a "regrouping" format with three classes scheduled for each of four periods. Three teachers are assigned to team teach. An additional teacher is assigned to the "team" and serves as a resource person to be used during the regrouping period (about 50 percent of the time). Regrouping is utilized during special science projects as well as to accommodate the diverse abilities of the students. Dividing three classes among four teachers creates for smaller classes. This meets the needs of the less able student as well as those with identified science aptitude.

San Antonio Independent School District Biomedical Program 282

Rose Mary Castro, Biomedical Teacher
Fox Tech High School
637 North Main Avenue
San Antonio, Texas 78205

Target Population: Grades 9-12

In a cooperative effort with the University of Texas Health Science Center, the San Antonio Independent School District Biomedical Program is an extended learning program for high ability students interested in medical careers. Now in its fifth year, this program's purpose is to upgrade and reinforce the student's scientific knowledge, and to further develop computation, reading, and writing skills through enriched studies in biology, chemistry, scientific literature, and research projects. Through interaction with the medical school personnel, the students develop an awareness of medical careers and the preparation towards those careers. The honors classes are lab-oriented and offer the students the use of advanced equipment, numerous science books, journals, and audiovisual materials. The students are given the opportunity to become more involved with their own learning by making presentations to the class. The medical school involvement includes tours, lectures, and demonstrations at the medical facility, visiting classroom lecturers, and student assignments to various research labs.

Science Discovery Room 283

Marilyn Silverman, Principal
Roslyn Junior High School
Locust Lane
Roslyn Heights, New York 11577

Target Population: Grades 7-8

The junior high school science curriculum is extended and reinforced in the Science Discovery Room. This is a unique laboratory room housing pieces of equipment which supplement the equipment ordinarily used by the students at the junior high level. The facility, which has been in operation for three years, permits teachers to guide students closely in the exploration of the curriculum through "hands-on" experimentation. Each student in the junior high school will spend 15 to 20 days in the Science Discovery Room. Students of various abilities and talents use the facility in different ways. All science and special education students use the facility. For example, seventh grade science students use the Discovery Room to explore microbe characteristics through the use of culturing materials and an incubator. Plants are explored using a climate control chamber. Pollution and solar energy are explored through the use of environmental analysis materials.

Science for Motivating Academically Talented Students 284

Phillip A. Smith, Principal
North Ridge Middle School
1619 North Jackson Street
Danville, Illinois 61832

Target Population: Grades 6-8 - Gifted Students

The program seeks to increase student interest in science by stressing the science process skills of observing, ordering, classifying, communicating, measuring, inferring, predicting, experimenting, modeling, and hypothesizing. The program design allows students who have ideas contrary to standard science explanations to function effectively. They learn to state problems, devise test situations that help them evaluate the stated problems. The goal is to depict science as an active process that uses knowledge to extend knowledge into new and different areas.

Science Institute 285

Dick Ullmann, Assistant Superintendent
Campbell Union School District
155 North Third Street
Campbell, California 95008

Target Population: K-8 Teachers

It was our intention in this institute to see science education return to the mainstream and again become a serious contender with the basic skills for our time, commitment, and staff development priorities. To accomplish this, we developed a summer Science Institute specifically to train a cadre of teachers in our district to be the focus of leadership in science education over the next several years. In 1984 and 1985, we conducted a one-week summer institute in some of the traditional methodologies and content in science education, as well as the process skills of observing, communicating, comparing, organizing, relating, inferring, and applying--key components of the new State Framework Addendum.

Science Lab 286

William Devich, Principal
Warren Elementary School
2791 Koper Drive
Sterling Heights, Michigan 48077

Target Population: Grades K-6

The Warner Science Lab was developed for the purpose of providing hands-on experience for elementary students in various concept areas of science. A total of 220 experiments were identified and compiled in 11 different categories by the 1982-83 Warner Teaching Staff. Each experiment is designated according to its grade level appropriateness. A student under the guidance of the classroom teacher selects an experiment and is scheduled for a 45-minute lab period. The lab offers six 45-minute lab periods daily, Monday through Wednesday. A maximum of six students attend at any one given 45-minute block of time. On these days, parent volunteers monitor the lab. On Thursdays and Fridays, the lab is available for teachers to schedule their entire class for a block of time. The responsibility of a volunteer parent is to assist the student in locating his/her assigned experiment and the appropriate materials. Upper elementary students are given a recording sheet to report observations related to their experiments. Science awards are given for the completion of an experiment.

Science Lab Implementation for Curricular Excellence (SLICE) 287

Jane R. McCullen, Instruction Director
Hopewell Public Schools
103 North 11th Avenue
Hopewell, Virginia 23860

Target Population: Grades 5-6

The program goals are to provide guidance for students concerning the safe and proper use of science materials and equipment; to provide active laboratory and field experience; to emphasize process skills (i.e., observation, classification, measurement, prediction); to stress creative thinking and problem-solving; and to provide opportunities for students to become aware of the role science plays in their daily lives. Emphasis is placed on process skills and hands-on activities in the laboratory. The homeroom teachers do textbook instruction and lecture in preparation for lab experience. The program was designed to correlate laboratory activities, textbook content, and the Virginia Standards of Living. The laboratory program was implemented during September 1985.

Science Lab Specialist 288

Joyce Kloncz, Science Lab Specialist
Mounds View Schools No. 621
2959 Hamline Avenue, North
St. Paul, Minnesota 55113

Target Population: Grades K-6

This is the second year of operation for Science Lab Specialists in the Mounds View elementary schools. These specialists join other specialists in the areas of art, music, physical education, and communications to offer children one 50-minute block per week in each specialist area. This offering provides elementary teachers with a full 50-minute preparation period a day. The curriculum relies heavily on ESS, SCIS, Project Wild, Learning Tree, and lessons adapted from the eight science lab specialists. Strong emphasis is given to the scientific learning process, inquiry teaching, and using problem-solving techniques. Science Lab Specialists have started Science Fairs at which students demonstrate the skills they have learned. This curriculum provides hands-on experiences as students become the "scientist" by classifying rocks, making electrical circuits, growing seeds, using a planetarium, and demonstrating pendulums.

Science Labs 289

George Plesac, Principal
Hobart City Schools
32 East 7th Street
Hobart, Indiana 46342

Target Population: Grades K-5

The goal of this practice is to have each elementary class, K-5, spend one period per week, 30-45 minutes, in the science lab participating in hands-on activities. A room has been set aside specificially to be used as a science lab. A curriculum guide is in the process of being developed which will include performance objectives for each grade level and lab experiences for the teachers to use in the lab setting. All science materials presently in the building have been placed in the science lab, in addition some monies have been allocated in the recent past to supplement the items on hand. For the calendar year 1986, there will be some monies appropriated in each elementary building to replace consumable materials and to add to the equipment.

Science - Learning Centers for Primary Classrooms 290

Paul M. Knipe, Principal
John Cline School
Claiborne Drive
Decorah, Iowa 52101

Target Population: Grades 1-3

This project was the result of the need to provide teachers with the science materials and classroom space so that time could be devoted to science, and to increase the degree and amount of science skills and concepts for the primary school students. The approach to eliminate these needs was to provide more science apparatus and materials that give students a wider variety of hands-on experiences; to organize a place in each classroom to be the "science learning center" that would be available to students during free times in the day; and to evaluate the primary school science program to determine how best to expose students to learning activities in new areas.

Science-O-Rama 291

William Albrecht, Teacher
West Middle School
1513 State Street
Alton, Illinois 62002

Target Population: Grade 8

Students are assigned a science concept (i.e., cloud formation, refraction, ballistics) and it is their responsibility to develop an experiment or group of experiments that will easily demonstrate the concept. The students then put on a Science-O-Rama to which other classes are invited. The students explain the concept and use their experiment as an aid. The visiting students have a visitor's card "checked off" at each station and receive science credit for their attendance. The development and explanation of a working science exhibit to demonstrate a concept is perhaps the best way to reinforce those concepts and to raise instruction to higher cognitive levels.

Science Program 292

Sharon Schlaff, Instructional Coordinator
Bloomfield Hills School District
4175 Andover Road
Bloomfield Hills, Michigan 48013

Target Population: Grades K-8

A K-12 curriculum committee was organized consisting of teacher representatives from each building, a central office administrator, school farm and nature center managers, and a teacher chairperson. An internal and external audit of the curriculum was conducted. The district committee then developed district goal statements and a science philosophy which were utilized by subcommittees writing specific course or grade-level objectives. The central office provided writing teams with a district format for developing program guides. After objectives were written, they were distributed to teaching staff and administration for input/revision. Laboratory core activities were specified for each grade level and course. A group of interested elementary teachers were provided with inservice training to become elementary science trainers for the district. For the first year of implementation of the new science curriculum, elementary science "helping teachers" were hired to assist teachers in each building with hands-on implementation.

Science Teachers and Scientists Interaction Project 293

Thomas Ritter, Teacher
West Windsor-Plainsboro High School
346 Clarksville Road
Princeton Junction, New Jersey 08550-1599

Target Population: Secondary Science Teachers

This project is an innovative teacher education program geared for secondary high school science teachers. The overall goal of the project is to create a program of activities involving interactions between a consortium of secondary schools and science/technology industries. Through this arrangement the project seeks to: a) extend teachers' experience in industry and update their understanding of applied scientific principles; b) assist teachers in upgrading science curricula; and c) create a school-industry partnership that promotes communication and industry participation in schools. Key components of the program include a two-week summer internship where teachers are provided with hands-on experience in industry. The internship is followed by curriculum development activities where teachers develop their experience into teaching modules on science careers and topics. A final program component is staff development workshops where teachers act as master teachers and present workshops to other science teachers from participating schools.

Science Technology Society Modules for High School 294

Jon Harkness, K-12 Science Specialist
Wausaw West High School
1200 West Wausaw Avenue
Wausaw, Wisconsin 54401

Target Population: Grades 9-10

This project was designed to address the need for scientific literacy at the high school level. The project consists of complete course modules for grades 9-10 that focus on four content categories: science processes; concepts of science; nature of science; and cultural implications. Through this unified science modular approach, students receive 40 minutes of instruction (lecture) once per week and meet another 160 minutes in a variety of medium or small group settings. There is a heavy emphasis on laboratory activities that stress application of scientific concepts and processes.

Scientific Abstracts 295

Gregory Baran, Principal
Garwood Middle School
4967 Garwood
Fairview, Pennsylvania 16415

Target Population: Grade 8

The goals of this practice are to expose the students to a variety of timely science topics and to enable the students to earn extra credit. The objectives are for students to select a major article from a scientific journal and to read the article and write an abstract of it. Various science journals suitable for reading by middle school students are located in the science room. These include such titles as Smithsonian, Discover, Science 85. Motivation to read these is provided by awarding a maximum of five points of extra credit for each article read and summarized. There is a maximum of three articles per grading period. A set of guidelines for the abstract includes points and a sample bibliography is posted in the science room. Students require little teacher time and no disciplining. Approximately 70 abstracts are prepared by students during each grading period. The abstracts enable students to become better informed on science topics and hopefully influence them to read scientific articles on their own.

Scottsburg Junior High Life Science 296

Sam Chattin, Teacher
Scottsburg Junior High School
South Third Street
Scottsburg, Indiana 47170

Target Population: Grades 6-8

The goals of this program are to sensitize, educate, and change the attitudes of young people about the natural world. This is done by training them and then giving them the responsibility as the "primary" care giver for wild animals that have been orphaned, injured, or diseased. From initial first aid to complicated surgery; short term captivity to permanent care; release back into appropriate surroundings; and captive breeding of "non-releasable" raptors and release of their offspring (i.e., endangered Barn Owls) is done by seventh grade students. This program has been in place for over ten years, with new facilities being added each year.

Secondary-Elementary Science Teacher Partnership 297

William O'Neal, Assistant Superintendent
Anderson Community Schools
30 West Eleventh Street
Anderson, Indiana 46016

Target Population: Elementary Teachers

The extent of training for elementary teachers in the area of science is somewhat limited. This would naturally affect the amount of science taught in the elementary classroom. A partnership has been formed between elementary teachers (third grade) and the well-trained secondary teachers. Activities have been planned to include workshops, laboratory experiences, retired teacher involvement, as well as demonstration lessons. Science equipment is being demonstrated and shared, and wise purchase of science materials is being achieved.

See What Science Is All About 298

Erin Rockwell, Product Manager
INSIGHTS Visual Productions
P.O. Box 644
Encinitas, California 92024

Target Population: Elementary Teachers

See What Science Is All About is a comprehensive training program on videotape designed for inservice/pre-service applications at the K-6 level. The program is presented at two levels (K-3 and 4-6) and consists of six videotapes which cover all major topics in earth and physical science. Two addtional tapes, released in January 1986, will cover the life sciences. Theory is explained in simple terms and is supported with a variety of useful classroom activities. This program has been in use for approximately six months and is presently being utilized by public and private schools, colleges, and universities in 38 states, Canada, and Puerto Rico. The goal of the program is to increase the quantity and quality of science instruction at the elementary level by explaining concepts in simple terms, demonstrating useful activities, and motivating teachers.

Self-Pacing 299

Hugo Pinti, Science Education Coordinator
Flint Community Schools
Science Teachers Center
925 South Avon Street
Flint, Michigan 48503

Target Population: Grades 7-8

Students begin with the same module and progress through the module and into other modules at individual rates. The key to this approach is that materials and equipment are accessible and visible. Students obtain their own materials. This means the teacher is not a dispenser. The methodology permits the teacher to spend more time with students who have greatest need. The teacher has a new role. The teacher does not lecture, does not demonstrate, does not show movies, and does not rely on useless "seatwork." Students are in the lab 70-80 percent of the time. Soon the students realize that they are responsible for their own learning.

Seventh and Eighth Grade Science Rotation 300

Gary D. Ramig, Science Chairperson
Fremont Junior High School
130 East 9th Street
Fremont, Nebraska 68025

Target Population: Grades 7-8

The goal of the school is to expose seventh and eighth grades students to an array of science units. At the seventh grade level, each student has a 12-week unit in earth science, life science, and physical science. Each 12 weeks the students rotate classes with teachers specializing in their area of expertise. The students rotate, the teachers do not. Students welcome the change of teachers and area of study. At the eighth grade level, the program is 12 weeks of physics, 12 weeks of chemistry, and 12 weeks of biology. Again, the students rotate but the teachers do not. Teachers, therefore, specialize in and enjoy a given area of activities.

Shelburne Farms Classroom Enrichment Institute (CEI) 301

Megan Camp, Director
Shelburne Farms Resources, Inc.
Shelburne, Vermont 05482

Target Population: Elementary Teachers

The Shelburne Farms Classroom Enrichment Institute is an in-depth training program for grades K-6 teachers. The purpose of the three-day training is to provide classroom teachers with a curriculum and instructional techniques needed to increase the quantity and quality of science and math taught in elementary grades. Teachers are introduced to a curriculum that stresses an interdisciplinary, hands-on approach to student learning. In addition, the curriculum organizes elementary grade lessons according to the four seasons and the accompanying changes in the environment. During the Institute, participants have the opportunity to practice many of the lessons under the guidance of project staff. CEI thus helps to build teacher competence and confidence in science and math instruction. Participants receive a copy of the CEI Four Seasons Guidebook at the end of the Institute; this book contains over 100 separate activities for classroom use.

Simple Machines (LEGO) Unit 302

Rod Vacek, Science Coordinator
Anoka-Hennepin I.S.D. No. 11
Elementary Curriculum Office, Educational Service Center
11299 Hanson Boulevard, N.W.
Coon Rapids, Minnesota 55433

Target Population: Grade 6

Ten goals have been established for this program. Briefly, they include concepts on the kinds, uses, mechanical advantage, and practical application of simple machines. Model construction and the role of friction are included. The concepts are achieved through hands-on construction of simple machine models, using the models to experience (experimentation) simple machine concepts, and discussion and analysis of simple machines used in real tools and machines (application). The materials include a Teacher's Guide written by Madelyn Hunter's teaching style (by Anoka-Hennepin teachers) and a LEGO/Technic I set. The 12 lessons cover approximately a quarter of the sixth grade science curriculum.

Sound/Sound Waves/Musical Machines 303

Frederick Podorf, Principal
Walnut Ridge Primary School
P.O. Box 190, Route 517
Vernon, New Jersey 07462

Target Population: Grades 1-4

Music curricula are generally limited to the components of nomenclature and theory of music, but surprisingly missing is the study of sound. It is my contention that in order to understand pitch, timbre, intensity, and duration of musical sounds, one must first examine the nature of sound waves, the production of sound, types of sound, the concept of vibration, the qualities of sound, how sound travels, and the reception of sound waves. Approximately seven years ago, I wrote a supplemental unit to my curriculum to introduce and explain these concepts to the music students. Methods include lectures, filmstrips, tapes, recordings, charts, art posters, and simple classroom experiments using the guitar, piano, the woodwind reed, and tuning forks. Concepts covered include the study of vibration and the vocal cords, the qualities of sound, and the range of audibility of the human ear, as compared to other animals. This leads us to a brief study of the structure of the ear. In addition, we study Edison's phonograph and examine the development of musical machines to the laser disc.

South Jersey Elementary Science Teaching/Learning Institute 304

Carl L. Calliari, Director
Glassboro State College
Department of Curriculum and Instruction, Elementary Education
Glassboro, New Jersey 08028

Target Population: Elementary Teachers

Through participation in and completion of this program's content and laboratory-oriented cumulative and sequential study sessions, approximately 720 primary and 720 intermediate grade teachers will increase their knowledge of science content and information processes related to frequently taught units in physical, life, and earth sciences curricula. Another program objective is for teachers to gain increased skills in using appropriate teaching strategies with particular emphasis on questioning strategies, inquiry techniques, and providing hands-on experiences. Priority for participation is given to female, minority, special education teachers, and teachers of traditionally underrepresented and underserved students. The institute serves as a model project for the design and delivery of curriculum inservice training incorporating both content (subject matter) and teaching methodologies, and its impact will be to improve education at the elementary level in southern New Jersey.

Special Inservice Training Efforts 305

Neal Eigenfeld, Curriculum Specialist
Milwaukee Public Schools
5225 West Vliet Street, P.O. Drawer 10K
Milwaukee, Wisconsin 53201-8210

Target Population: Elementary Teachers

A teacher inservice center was established at the Kluge Elementary School to provide inservice education to all regular classroom teachers in 30 selected elementary schools. The teachers at any given grade level are released two days from their classrooms and given 12 hours of inservice training in process-oriented science. They also are given the opportunity to work through specific activities with the materials that are readily attainable from the science kits which they can order from the Kluge Science Materials Center. No more than 20 teachers attend the workshop at any one time. One of a team of curriculum supervisors and a science teacher inservice specialist provide the 12 hours of inservice instruction.

Study of the Atom 306

Gregory Baran, Principal
Garwood Middle School
4967 Garwood
Fairview, Pennsylvania 16415

Target Population: Grade 6

The objectives of this practice for students are to develop an understanding of the fundamental particles of an atom; to learn the structure of an atom; to discover how atomic weight is determined; to discover how atomic number is determined; to learn what is an ion; and to learn what is an isotope. The class will look at models of atoms suspended from the ceiling. These models are constructed of hula hoops of varying circumferences with a sytrafoam ball suspended in the center. An explanation of the styrafoam as representative of the nucleus and what particles are found here is given (protons and neutrons). The students are told that the protons and neutrons are used to determine atomic weight. The hula hoops are representative of the paths electrons travel around the nucleus, just as planets orbit the sun. Then students are given paper and yellow and red painted discs to construct models of atoms to determine atomic weight.

Summer Science Program 307

C.R. Nelson, Elementary Education Director
Mankato Public Schools, District No. 77
1000 North Broad Street
Mankato, Minnesota 56001

Target Population: Grade 6

During the summer of 1985, all students currently in the sixth grade had an exciting and unusual opportunity. District 77 operated a carefully-developed week-long (30 hours) outdoor science program which was intended to stimulate interest in the sciences. Each day during the week was different and provided students will lots of hands-on learning activities. Each day was taught by a different instructor who took the class to specially selected sites. Some of the field trips were to places like Minneopa State Park, Lake Washington Park, Seven-Mile Creek County Park, Land-of-Memories Park, and others. Some of the topics covered in the program were stream biology; rocks, soil, and life in a park environment; interdependence of living things at the lake; and improving life in a wildlife area.

Super Science Saturday 308

Peggy Teters, Elementary Science Curriculum Supervisor
Springfield Public Schools
940 North Jefferson
Springfield, Missouri 65802

Target Population: Grades 4-6

The goal of this practice is to further the student's ability to develop and carry through a scientific investigation. Students throughout the district participate in the development of a science fair project. Guidelines have been developed by a group of classroom teachers. No awards or judging takes place. Instead, an evaluation of the project takes place with guidance given for improvement. On a designated Saturday, these projects are taken to one central location for display. At that time, mini-sessions are conducted by high school, college, and community individuals which are of high interest for elementary students. This practice has been in place for four years.

Systematic Approach to the Development and Implementation of Consumer Chemistry into the Bedford County Science Curriculum 309

Margaret L. Duncan, Math/Science Instructional Specialist
Bedford County Public Schools
310 South Bridge Street
Bedford, Virginia 24523

Target Population: Grades 10-12

The goals of this program are to add scope to science literacy in general, and chemistry in particular, for students in grades 10-12, by providing a chemistry curriculum emphasizing a practical knowledge of everyday chemical applications. Primary consideration is directed towards students whose academic qualifications indicate the need for a chemistry course regarding skills of a less rigorous nature as opposed to an academic chemistry course. Also considered are those students who, for career reasons, desire a chemistry experience. Consumer Chemistry is designed to provide a practical knowledge of chemical concepts and use. Students in return, as functioning citizens, will be equipped to execute sound judgment concerning the uses of chemicals in their environment and daily life.

Talcott Mountain Science Center (TMSC) 310

Donald P. LaSalle, Director
Talcott Mountain Science Center
Montevideo Road
Avon, Connecticut 06001

Target Population: K-3 Elementary Teachers

There are two primary goals for the Talcott Mountain Science Center. One is to determine whether kindergarten through third grade teachers increase their time in teaching science content, as well as significantly improve their attitudes towards teaching science, as a result of their exposure to the curriculum of this project. The other goal is to demonstrate evidence that the students of these teachers significantly improve in attitudes toward the learning of science and knowledge of science concepts, as a result of their exposure to the center's curriculum.

Target: Program Improvement 311

Doris Selub, Assistant Superintendent
Freeport Public Schools
P.O. Box 50
Freeport, New York 11520

Target Population: Grades K-12

A science task force of teachers, supervisors, and administrators representing varying grade levels was charged with assessing current programs and practices, determining needs, defining goals, and recommending improvements. The task force, under the direction of the Assistant Superintendent for Curriculum, met over a one-year period, culminating in a set of recommendations including improvement of facilities and equipment, text adoption, increasing laboratory time, and the establishment of co-curricular assignments at the elementary level of science facilitators. The recommendations were accepted by the Superintendent and the Board of Education and implemented in the following year. Subsequently, the task force has been convened on an annual basis for review and further recommendations. Inservice workshops for other staff members have been implemented and assignment continues.

Teaching Elementary School Science through a Laboratory Approach 312

Frank Genovese, Superintendent
Whitehall Elementary School
Buckley Road
Whitehall, New York 12887

Target Population: Grades K-6

A science center, specially designed and equipped to permit a hands-on, laboratory approach to teaching and learning elementary school science was established in Whitehall Elementary School in the summer of 1984. It was anticipated that the center and the methodologies used would develop in elementary children an early awakening to the true nature of science, a corresponding growth in scientific literacy, and an enhancement of critical thinking and problem-solving capabilities. A teacher with strength in physical and life sciences and with experience in working with K-6 students was employed on a full-time basis to run the lab. The regular teaching force of 28 teachers was expected to accompany individual classes to the laboratory and to follow-up and coordinate what went on in the laboratory with what was taught in the classroom. In this latter regard, the lab teacher was also vested with coordinator responsibilities.

3-2-1 CONTACT 313

Edward G. Atkins, Director
Children's Television Workshop
1 Lincoln Plaza
New York, New York 10023

Target Population: Grades 3-7

3-2-1 CONTACT is a science and technology series produced by the Children's Television Workshop (CTW) and broadcast on PBS. The series is aimed at a primary target audience of 8-12 year olds and has three major goals: to help children experience the joy of scientific exploration; to help children become familiar with various styles of scientific thinking; and to help children, with a special appeal to girls and minorities, to recognize science and technology as open to their participation. Each segment uses a 30-minute magazine format of studio, documentary, and animation segments. Segments within a single broadcast week are organized into science themes (e.g., Big/Little, Flight, Space). In addition, the series includes a daily dramatic segment, The Bloodhound Gang, in which a group of young detectives solve mysteries using scientific approaches. The series was initially broadcast on PBS in 1980 (13 weeks totaling 65 shows) and has continued through mid-1983 in up to five repeat broadcast cycles on PBS stations across the country.

To Their Hearts and Minds through Their Stomachs 314

Isabelle Koren, Dean of Students
Lakewood Prep
163 Lanes Mill Road
Howell, New Jersey 07731

Target Population: Grade 5

Although hands-on experiences are becoming more popular, even pulleys and pendulums can become humdrum. Over the past seven years, I have been adding various activities using edibles in class. For example, peanuts may be weighed, classified, described, or compared. Their flavors may be evaluated. Metric recipes are used to prepare salads and spaghetti sauce. Students write directions for peanut butter sandwiches. The teacher follows their directions exactly. Even though eating in science class is frowned upon, the value of these special lessons outweighs the potential problems. I take the fifth grades to the cafeteria on those occasions when they are working on edible experiments.

Treasure Hunt 315

Marjorie Arnsdorff, Middle School Science Coordinator
Savannah Country Day School
P.O. Box 14256
Savannah, Georgia 31419

Target Population: Grades 8-9

The goal of this Treasure Hunt is to test students' lab proficiency. Although Treasure Hunts are usual, this one looks at the substances to be found so students must brainstorm and actually do several tests in order to find the answers. They must think and cooperate with others. For the Treasure Hunts, lists are made of several tests. Students are divided into groups of two or three. All substances to be found are in the lab somewhere. The substances must be collected and brought to the teacher. When all substances on the list are found, the first team becomes the winner. For example, a list might contain a substance with density less then water, a substance with the density of .9, and a substance that freezes at 83 degrees C.

Unified Science - 9th Grade 316

Ted Cherry, Assistant Superintendent
Reynoldsburg City Schools
6549 East Livingston Avenue
Reynoldsburg, Ohio 43068

Target Population: Grade 9

Unified Science encompasses all of the science areas and studies the processes, concepts, phenomena, and persistent problems common to all sciences. The goals of the program are for students: to develop self-reliance and independent thinking; to increase their skills in logical thinking processes related to both science and the real world; to increase their knowledge of themselves, their behavior, and relationship to their world; to increase their basic reading and math skills; and to increase their ability to be organized and logical. The units of study include observation, measurement, classification, ecosystems, energy, and problem-solving. Each of these units are approximately four weeks in length and applies the scientific process to the areas of Physics, Chemistry, Biology, Geology and Astronomy, Psychology, and Life and Physical Science. The teacher attempts to direct students toward use of their own potential resources and skills in attacking science learning.

Use of Computers in the Science Classroom 317

Ron Jones, Science Coordinator
Salem-Keizer Public School District 24J
1309 Ferry Street, S.E.
Salem, Oregon 97309

Target Population: Secondary Science Teachers

The goal is to integrate the use of computers into the science classroom on a planned systematic basis. The computer's primary function will be to build databases, graphic analysis, extrapolation of data and error analysis. Secondary functions will include quantitative treatment of data. The overall plan includes four phases: 1) teacher training on application software; 2) piloting the program in the high school physics and chemistry classes; 3) networking between the five district high schools; and 4) evaluation, revisions, and expansion to other programs.

Use of Elementary Science Materials 318

Neal Eigenfeld, Curriculum Specialist
Milwaukee Public Schools
5225 West Vliet Street, P.O. Drawer 10K
Milwaukee, Wisconsin 53201-8210

Target Population: Grades K-6

A science materials center was established at the Kluge Elementary School to provide regular classroom teachers, in 30 selected elementary schools, all the supplies and equipment necessary to teach any elementary science unit in any grade, K-6. The materials for any given science unit at any given grade level are loaned for a period of four weeks. With this system, any one kit can be used six times during the school year, thus providing a great savings in materials. Day to day operations are carried out by two aides who get the kits ready for delivery, refurnish the kits that have been returned (replacing the broken, missing, or consumable materials), and keep an inventory of materials in the center.

Use of Inquiry as a Teaching Method in Science Education 319

Dee Schatz, Science Instructor
Ponca Public School
P.O. Box 610
Ponca, Nebraska 68770

Target Population: Grades K-9

In the Ponca Science Department, we utilize as many methods of instruction as we can. Our goal is to make every student in our science program aware of the scientific processes that they encounter everyday. To help them with this, we supplement our textbook learning with scientific inquiry and experimentation, creative challenges, computer programs, video programs, Quiz Bowl and Science Competition, science projects, field trips, and anything else we can bring to our classroom or get our students out to. This year we started a Science Club and had a 75 percent turnout from grades 7-12.

Video Lesson 320

Alexander Zajac, Principal
Isaac E. Young Junior High School
270 Centre Avenue
New Rochelle, New York 10805

Target Population: Grades 7-8

About two years ago when a video recorder and camera were made available to the science department, we decided to record a lesson introducing the use and parts of a compound light microscope. The teacher who was to conduct this lesson in the classroom was chosen to do the lesson on tape. Members of the science department use a video recorder and camera to tape certain lessons. It broadens instructional techniques available. It works in the following manner: a teacher first tapes the lesson. When it comes time to conduct the lesson, the teacher first distributed microscopes to students and then, using a large monitor, plays the pre-recorded lesson for students to view. While students view the tape and followed directions as recorded, the teacher is able to go about the room assisting any students who are having difficulty. The use of this method in essence "duplicated" the teacher and provided the class with another person serving as a lab assistant.

Video - Team Dissections 321

Mark Foseid, Science Department
Horizon Middle School
3981 South Reservoir Road
Aurora, Colorado 80013

Target Population: Grades 7-8

Our science department has created videotapes of selected dissection procedures on the fetal pig, frog, worm, and starfish. We use these tapes in a teaming situation where students view them and perform the dissection. Teachers are free to facilitate and give individual instruction while other students follow the tape. We play the tapes and do the dissections in two or three classes simultaneously so that the maximum number of students can enjoy a common learning experience. The videotapes also allow for more vivid instructions than the lab manual approach. Of 230 dissections of the abdomen of the fetal pig, there were only five mistakes in technique.

Videomicroscopy 322

Bill Foster, Junior High Science Teacher
Gibbon High School
Box 790
Gibbon, Nebraska 68840

Target Population: Grade 7

The goals of this practice are for students: to gain an understanding of microscopic organisms, their similarities and differences, with emphasis on protists; to improve writing skills; to practice oral speaking; and to enjoy pure open-ended scientific research. The class selects samples which are studied under the microscope. Selected samples are videotaped through the microscope. Students keep a daily lab notebook and write a report about one organism. Then each student dubs an oral report onto the video of his/her organism. Equipment needed includes microscopes, videotape recorder, television, video camera, live samples, and slides.

Water Quality Study 323

Joyce Hander, Science Chairperson
Paris High School
602 North 10th Street
Paris, Arkansas 72855

Target Population: Grades 9-12

The goal of this program is for students to perform certain chemical and biological tests on the main watersheds of Logan County, Arkansas. The chemical tests relate to salinity, hardness, pH, and dissolved gases. The electrical conductivity, pH, dissolved gases, and temperature are checked at the site. Nitrate, sulfate, and hardness tests may be made at the site or in the laboratory. Twelve watershed sites in Logan County were selected with the advice of the county agent. These sites are representative of the entire county. They range from ponds to city water supplies. A field notebook is kept by each student with general information on each site. Sky conditions, air temperature, and exact location are noted.

Weather Map and Observation Study 324

Douglas W. Weigel, Principal
Chestnut Elementary School/Fairview School District
7460 McCray Road
Fairview, Pennslyvania 16415

Target Population: Grade 4

A grade four classroom instructor has extended a science unit on weather. At the beginning of each school day a study is made of the weather charts from the U.S.A. Today newspaper and put on the bulletin board designated for that purpose. An awareness and interest is generated in monitoring weather throughout the country and in using the newspaper daily for gaining knowledge. The newspaper becomes part of the students reading which has expanded to other areas of reading other than that of weather. Students also request to use the dial-a-weather information.

West End Environmental Center 325

Nola A. Bacci, Principal
West End School
Clark Avenue
Lynbrook, New York 11563

Target Population: Grades K-5

The Environmental Center, in operation since September 1984, was created through the conversion of a classroom space into a simulated natural environment through the addition of three greenhouse windows, potting tables, and a variety of aquaria and terraria. The Center provides an exciting arena for learning within which students are actively engaged in a variety of hands-on experiences aimed at developing awareness, understanding, and appreciation of the interdependence of man and all aspects of our natural environment. The ultimate goal is the development of concerned, informed citizens who will maximize the potential of our natural environment. Major topics of study include plant and animal life; interdependence of man and nature; air, water, and land pollution; endangered species; world hunger; and the exploration of the sea and space as future resources for food and habitation. Through a variety of outgrowths of the program, the Center has become the focal point of a myriad of building-wide activities.

Whitetail Environmental Center (WEC) 326

William R. Einsig, Science Advisor
West Shore School District
1000 Hummel Avenue
Lemoyne, Pennsylvania 17043

Target Population: Grades K-12

WEC is a district-operated environmental center designed to support the district curriculum in science and social studies. All students in grades kindergarten through sixth grade visit the center for a planned program specific to their grade level. Teachers also visit the center at times of their choice for a wide variety of lessons. Classes of students beyond the sixth grade visit upon the request of their teacher but may visit as often as the teacher wishes. The staff consists of three full-time environmental teachers constituting their own department and their own budget.

Woods Quality Study 327

Doug Kuban, Junior High Science Teacher
Pecatonica Grade School
Reed Street
Pecatonica, Illinois 61063

Target Population: Grade 7

Students use dichotomous keys to learn botany terminology and identifying trees. The class is divided into groups: canopy, understory, and ground cover report. They identify, tally, and calculate percentages of tree species at the local forest preserve. Species are assigned quality points in order to rank areas of the woods (low to high quality). Random samples are also taken, and observations on humankind's impact on the woods are recorded. This interdisciplinary approach encompasses areas of science, math, language arts, and physical education. It encourages group cooperation and stresses process skills such as observing, recording, and inferring.

Writing in the Science Curriculum 328

Barbara K. Johnson, Science Department Chairperson
Rocky Run Intermediate School
4400 Stringfellow Road
Chantilly, Virginia 22021

Target Population: Grades 7-12

The objective of this practice is for students to use various writing styles to reinforce science concepts. During the physical science modules, articles found in science publications that reflect various writing styles are read by the students. They are read for content while noting interesting ways to develop concepts. At the completion of each nine week module of study, the reading specialist is invited to present a lesson on various writing styles, such as myth, editorial, fiction, and poetry. The students are given a vocabulary test that includes names of scientists who made significant contributions to the area of science studies. Students are asked to choose what concept learned in the module of study they would like to develop in a specific writing style. The day the writing projects are due, students spend part of a period having a partner read and respond to the writing, followed by corrections and rewriting. The articles are submitted and graded.

Y.E.S. - Students Educate Youth **329**

Louise Mary Nolan, Teacher
John F. Kennedy Memorial Junior High School
Middle Street
Woburn, Massachusetts 01801

Target Population: Grades 1-6
Grades 8-9

Y.E.S. is a program designd to stimulate interest in and to increase knowledge about one's environment. The program is scholastic in nature, using the scientific method to help junior high school students explore their environment. At its conclusion, the program shows its concern for the social development of the students, allowing them to use their knowledge, skills, and talents to develop programs designed for elementary school children. The programs developed include: a) an encology (energy and ecology) fair for students in grades 1-3; b) an activity book dealing with toxic materials for students in grades K-3; and c) a poster contest dealing with hazardous waste materials for students in grades 4-6.

Section III

MATHEMATICS AND SCIENCE PRACTICES

Center for Mathematics and Science Education 330

Hunter Ballew, Director
University of North Carolina-Chapel Hill
201 Peabody Hall 037A
Chapel Hill, North Carolina 27514

Target Population: Mathematics and Science Teachers

The goal of the Center is to establish updating and renewal programs in partnership with local school districts, business, industry, and government. To date, such programs have been developed for middle school mathematics teachers, middle school science teachers, advanced placement calculus teachers, advanced placement chemistry teachers, and advanced placement biology teachers. Astronomy programs for third, fourth, and fifth grade teachers have been developed in conjunction with the Morehead Planetarium. Cooperation between the School of Education and the College of Arts and Sciences within the university and collaboration with the public schools is an integral part of the structure of this new organization.

Computer Managed Instruction/Criterion-Referenced Testing 331

Ed Weber, Math Facilitator
Twin Spruce Junior High School
7th and Gillette Avenue
Gillette, Wyoming 82716

Target Population: Grades K-12

The goals of this program are to provide the district personnel with an effective method of evaluating curriculum and to provide individual teachers with an efficient method of evaluating student achievement. The program is operated by an IBM System 38 computer and utilizes the current district-developed curriculum. Through the use of the computer, we are now able to collect and analyze data about student performance at the district level. Because the testing is directly correlated to curriculum, we are better able to identify weaknesses with the program. We are currently implementing the program in math, science, social studies, and art.

Corridor Partnership for Excellence in Education (CPEE) 332

Gail A. Digate, Executive Director
Corridor Partnership for Excellence in Education
2111 Plum Street
Aurora, Illinois 60506

Target Population: Mathematics and Science Teachers

The Corridor Partnership is a unique consortium of leaders from education, science, government, labor, business and industry located in northern Illnois. The Corridor Partnership promotes, encourages, and fosters high quality education in area institutions with a particular emphasis in the disciplines of mathematics and science. CPPE works directly with representatives from local business, industry, and research facilities to meet the growing technological and economic needs of the communities served by the Partnership. The Corridor Partnership encourages "hands-on" practical mathematics and science experiences through specialized programs and innovative institutes. Further, CPEE enhances mathematics and science teachers' preparation and continuing development through timely seminars and conferences; accesses schools to valuable materials and technical resources through establishment of "partnerships" with local businesses and industry; and coordinates advanced internships for teachers and sponsorship programs for students in research and business environments.

Food Safety Adds Up to Good Health--You Can Count on It 333

Judy Liggett, Coordinator
National Food Safety Poster Contest
USDA-FSIS-Room 1165S
Washington, D.C. 20250

Target Population: Grades 1-6

Since 1982 elementary school students across the nation have learned how to protect themselves from food poisoning--with numbers. The purpose of the National Food Safety Poster Contest is to teach children the basics of safe food handling practices. This practical information, instilled at an early age, serves children throughout their lives. It is also particularly important for this age group to learn how to properly handle and prepare perishable foods because over a quarter million children contract food poisoning each year. The contest packages its health messages with math skills and drills. Students in grades one and two, for example, learned how to read a thermometer so they could understand the important role of temperature in keeping food safe. These materials prepare students to enter the poster contest and compete for top prizes--savings bonds and trips to Washington, D.C. This annual contest is open to every first through sixth grader attending school in the United States.

Galileo Institute 334

Art Jensky, Director
Freeport High School
South Brookside Avenue
Freeport, New York 11520

Target Population: Grades 9-12

A committee of science and math staff from the high school met with the Assistant Superintendent for Curriculum to plan a program to foster research in science and math. In the current first year of implementation, students on a voluntary basis agree to do a research project for which they are assigned a mentor from our staff. These projects will be considered for entry in local fairs and exhibits. In the second semester, students will be encouraged to sign up for an after-school course in science or math research. This cycle will be continued towards the goal of developing more sophisticated research projects. We expect to offer an in-house summer program and in addition to nominate selected students for summer programs elsewhere. We are opening participation in the Galileo Institute to all academic levels in science and math rather than selecting only from the honors group.

Galileo, Jr. 335

Doris Selub, Assistant Superintendent
Freeport Public Schools
P.O. Box 50
Freeport, New York 11520

Target Population: Grades 4-6

Using the "Voyage of the Mimi" program as the keystone, students have been engaged in a science/math/technology program to extend knowledge, foster understanding of the scientific inquiry process, and apply skills to higher levels of learning. Problem-solving through simulation and "real life" problems is an essential part of the learning. Freeport was selected as one of four pilot districts in January 1985. Pilot teachers and teacher trainers took part in extensive training prior to implementation. In June 1985, the decision was made to extend the program to all fifth grade classes for the current year. The "Mimi" program includes a series of television programs, computer software, and text material. The high level of motivation and interest has led to integration with language arts and social studies.

Garland Excellence in Teaching Program 336

Barbara Mason, Assistant Director of Research
Garland Independent School District
720 Stadium Drive
Garland, Texas 75040

Target Population: Science and Mathematics Teachers

The Garland Excellence in Teaching Program is an inservice program which uses a combination of selective recruiting, instruction, and developmental supervision to produce a cadre of highly effective math and science teachers in kindergarten through high school across the district. Twenty teachers were selected through a nomination, application, and review process to receive 45 hours of state-of-the-art instruction in "effective teaching practices," based on current literature and grounded in math and science content. Upon completion of the program, these teachers will use instructional materials developed for the course to train other district teachers. This program is based upon the premise that when science and math courses are effectively presented, based upon the knowledge gained from the recent teacher effectiveness literature, student achievement and attitude toward these subject areas will improve.

High School-College Cooperative Learning Program 337

Jackie Betts, Coordinator
Berea College
CPO Box 67
Berea, Kentucky 40404

Target Population: Secondary Teachers
College Instructors

The goal of this program is to recognize and nurture educational excellence and cooperation among teachers through shared learning experiences. The methods include multi-weekend workshops for high school students and teachers during the school year; two-week seminars for high school teachers during summer; and programs involving college faculty as part-time consultants. The program has been funded for four years, beginning in 1983-84, through a Mellon grant. Mathematics topics treated have included computers, topology, curriculum development and modification, and applied math. Science topics have included field biology/ecology, experiments and demonstrations in physical sciences, and the Foxfire approach to curricula.

Homework Hotline 338

Freddie Renfro, K-12 Mathematics Coordinator
LaPorte Independent School District
301 East Fairmont Parkway
LaPorte, Texas 77571

Target Population: Grades K-12

Homework Hotline started in the LaPorte School System in October 1984. The program's main goal was to provide K-12 students with assistance in doing their homework in mathematics. The program has expanded this school year, 1985-86, to include science. Students needing help in both subjects can call the hotline number on Monday through Thursday from 5:30-8:00 p.m. and receive assistance from a math or science teacher on problems they encounter in completing their homework. Two high school students assist the teachers and operate the switchboard. The teachers have access to the teachers editions and workbooks that students are using in their math and science classes. Posters were placed in all buildings and in math and science classes to help remind students of this program. Flyers were also issued to every student in the beginning of the school year for their notebooks.

Instructional Microcomputer Projects for Arkansas Classrooms (IMPAC) 339

Cecil McDermott, IMPAC Director
Arkansas Deparment of Education
State Education Buildings
Little Rock, Arkansas 72201

Target Population: Grades 4-8

IMPAC is a joint effort between government, education, business, and industry. A commission directs the program and some activities are conducted through a nonprofit company, IMPAC Learning Systems, Inc. The program provides complete support--hardware, courseware, inservice, and maintenance. The program is in its third year at 26 experimental sites and 43 dissemination sites. CMI/CAI Basic Skills Program in Mathematics, Reading and Language Arts, and Science are being developed for Apple IIe/Corvus hard disk network with management capability. Approximately 25 microcomputers are used in a lab or four per classroom for self-contained programs.

Mastery Learning Instructional Model 340

Jacquelyn S. Lindsey, Instruction Director
Goochland County Public Schools
P.O. Box 169
Goochland, Virginia 23063

Target Population: Grades K-6

The Goochland Schools are now in the fourth year of the Mastery Learning Model Essentials-Correctives-Enrichment (ECE) developed by Dr. Wayne Pruitt and Dr. Jeff Lee of Francis Marion College, Florence, South Carolina. To improve the instructional delivery mode and students' mastery, ML units are written to focus on specific identified areas of need in math and science. A typical unit runs two to three weeks. The opportunity for the enrichment track provides experiences beyond the basal text, including research skills and creative expression. Audiovisual materials and computers are used extensively. Units are reviewed by consultants and there is one-to-one consultation provided. These units can be shared and adapted by other teachers within the division. A commonality of language and procedure provides a uniform approach to instruction, resulting in positive spin-offs into other subject areas.

Math and Science Focus for Model Rocket Construction 341

Ann N. Landry, Life Science Teacher
Angleton Middle School
1800 North Downing Road
Angleton, Texas 77515

Target Population: Grades 6-8 - Gifted Students

The goal of this practice is to incorporate the basic principles of math and science using the aerodynamics of model rocket building and launching. The construction and launch of model rockets is not a new endeavor, however, to make it available to a wide range of gifted and interested students plus provide guidance in the innovation that can be used with math and science is greatly needed. The materials used are model rocket kits, launch systems, tracking devices, additional rocket construction kits, and math tracking projects. The methods involve the construction of kits and tracking devices with instruction as to their use plus innovative projects for additional observation. The length of time needed is two hours after school on two consecutive days plus additional meetings to carry out innovations.

Math/Science: An Interdisciplinary Approach 342

Louis Corbosiero, Math/Science Teacher
Pollard Middle School
200 Harris Avenue
Needham, Massachusetts 02192

Target Population: Grade 7

Our program focuses on the interdisciplinary approach to teaching some topics in Life Science at the middle school in conjunction with the mathematics teacher. We have written two long units (two weeks each) on the "Metric System" and "Genetics and Probability" and four short units (two days each) on "Bone Detective," "The Heart," "Finger-painting," and "Calories." The main emphasis is to demonstrate that mathematics and science are related, can be taught as being related, and that mathematics is the tool that the scientist uses to measure, collect, and analyze data to arrive at a conclusion.

Mathematics and Science Education Network (MSEN) 343

Vinetta Jones, Coordinator
University of North Carolina
201 Peabody Hall 037A
Chapel Hill, North Carolina 27514

Target Population: Mathematics and Science Teachers

MSEN is a comprehensive, statewide program aimed at significantly upgrading mathematics and science education. It is composed of nine teacher training centers and a research and development center, each housed at a constituent institution of the University of North Carolina. The centers have as their goals: increasing the quality and availability of mathematics and science teachers in N.C. public schools; strengthening instruction in the middle grades and high school programs in mathematics and science; sponsoring basic research and development in education; and increasing the effective use of educational technologies in all schools. Each center operates on a year-round basis to provide inservice training and continuing education for middle grades and high school mathematics and science teachers. Among the centers' offerings are special workshops, summer institutes, and graduate credit courses aimed at helping to update and recertify teachers.

Mathematics and Science Skills Collaborative Project 344

William Belanger, Natural Science Professor
Worcester State College
486 Chandler Street
Worcester, Massachusetts 01602

Target Population: Elementary Teachers

This project is a collaborative effort between the Worcester State College and approximately 50 elementary schools in Worcester and nearby towns. Each year about 70 elementary teachers representing all grades K-6 take part in a series of programs on Thursday afternoon/evening and all day on the following Friday. The meetings are led by subject matter specialists from the college and are designed to increase the subject matter knowledge of the participants in various fields. Biology, astronomy, energy, geology and mathematics are among the topics considered. Activities include a lecture, a laboratory session, and discussion on how the topic may be used in the elementary schools. Teachers leave each session with a variety of materials to use in their classrooms. A resource center makes additional materials available or allows teachers to design their own and the professors are available to visit classes in the participating elementary schools.

Mathematics/Science Enrichment Program 345

Vincent F. O'Connor, Mathematics Curriculum Specialist
Milwaukee Public Schools
P.O. Drawer 10K, 5225 West Vliet Street
Milwaukee, Wisconsin 53201-8210

Target Population: Grades 3-8 - Advanced Students

The goals of this summer school program are to develop both interest and achievement in mathematics and science among children who demonstrate high achievement in schools where average achievement is low. Once identified, the children are invited to attend the summer session by a personal letter from the superintendent. Bus transportation is provided daily to a summer enrichment center where the students are engaged in mathematics and science experiences from 8:30-11:30 a.m. Field trips, motivational materials and topics, microcomputers, and an innovative staff combine to make the experience exciting for all involved. The project began in 1985 as an extension of the "Junior Scientist" summer program which has been in existence since 1983.

Mathematics/Science Task Force **346**

Carol L. Davidow, Coordinator for Schools
Cincinnati Business Committee
1706 DuBois Tower
Cincinnati, Ohio 45202

Target Population: Grades K-12

Ongoing involvement (and monthly meetings) of top school district staff, business experts, and university leaders from the math, science, and teachers colleges was begun in April 1983. The Task Force examines structural, motivational, and curricular needs and problems within the context of a long range plan into which fits yearly plans targeting specific goals. Some achievements to date are: greater involvement of teachers in planning (through advisory councils, brainstorming); development of a comprehensive NSF proposal which dovetails with state grant applications and local district training plans; and systematic involvement of counselors in the problem of recruiting students, particularly blacks and females into advanced math and science courses. This growing collaboration has provided an increased understanding of the resources and mutual needs of the school/business/university worlds. A team feeling has developed with mutuality of interest in sharing problems, solutions, and weaknesses.

Middle School Interdisciplinary Curriculum **347**

Charlotte E. Remaley, Mathematics Curriculum Specialist
Hampton City Schools
1819 Nickerson Boulevard
Hampton, Virginia 23663

Target Population: Grades 7-8

Interdisciplinary curriculum units in core academic subjects (English, Mathematics, Science, and Social Studies) were developed during 1984-85 to be used beginning September 1985. The goals are to correlate and integrate instructional approaches to certain processes, topics, and content of existing curriculum; to include concepts and practices of reading and writing to learn and collaborate on work; and to enhance the team teaching aspect. Interdisciplinary instruction provides a model for achieving effective learning at the middle school level. In addition, this approach helps students and teachers to make connections between learning across subjects.

Options for the '80's - Mathematics and Science Institute 348

Winston Hoskins, Science and Health Director
Dallas Independent School District
5000 South Oakland Avenue
Dallas, Texas 75215

Target Population: Mathematics and Science Teachers

The purpose of this program is to respond to the shortage of quality science and mathematics teachers for secondary schools. The Dallas Independent School District in cooperation with the University of Texas at Dallas and the Council for Basic Education developed a program to take teachers from areas other than science or mathematics and enroll them in a program for preparation to be certified science or mathematics teachers. All stipends, tuition, fee, and books are paid. A few teachers presently teaching science and mathematics, but in need of skill upgrading, are also included. The program is financed by private grants, school district funds, and contributions from the university. Unlike most programs which focus on teachers who have been identified as excellent, this program focuses on the retraining of teachers.

Pennsylvania Science Teacher Education Program (PA STEP) 349

Ken Mechling, Director
Clarion University of Pennslyvania
Center for Science Education
Clarion, Pennsylvania 16214

Target Population: Science and Mathematics Teachers

PA STEP is designed to upgrade the skills of science and math teachers in Pennsylvania in order to improve the overall effectiveness of science and math education. Teachers and administrators participate in inservice programs which offer tuition-free graduate credits funded by PHEAA. There are several different courses offered annually through PA STEP at 22 colleges and universities and the 29 intermediate units--Program for Improving Education Science (PIES) for elementary teachers; Computer Orientation for Reshaping Education in Science (CORES) for secondary teachers; and Program for Enhancing Elementary Leadership in Science (PEELS) for principal/teacher teams. Other courses being piloted during the third year of operation include Science Technology Society, Creative Integration of Science in Elementary Education, Microcomputer Lab Interfacing, and Career Orientation for Science and Technology.

Practical Applications of Math and Science (PAMS) 350

Cheryl Buck, Program Coordinator
Kirby School District 140
17100 South Ozark, Box 98
Tinley Park, Illinois 60477

Target Population: Grade 6

This program was developed, in part, to answer growing concerns about math and science. The experience offered by the PAMS program enables students to apply classroom learning to hands-on situations and real-life problems. The goals are to develop observational skills and environmental awareness; to cultivate the skills necessary to investigate and interpret one's surroundings; to apply math skills for everyday problem-solving; to utilize the scientific method in an outdoor laboratory setting; and to pre-service and inservice teachers in the working of the PAMS program. Instructional activities include: pond study, tree identification, quadrat (succession) study, orienteering, and math. Equipment used are microscopes, trundle wheels, aquatic dip nets, compasses, meter sticks, and balances. The sixth graders prepare for a three day, two night program throughout the school year. They learn techniques and the use of scientific equipment before using it in the out-of-doors.

Professional Growth Institute 351

Carol Yudofsky, Staff Development Associate
Cincinnati Public Schools
Office of Staff Development
1908 Seymour Avenue
Cincinnati, Ohio 45237

Target Population: Mathematics and Science Teachers

The Professional Growth Institute provides inservice education for teachers. The courses are designed to update or reinforce the teaching skills of mathematics and science teachers. Each year classes are offered in the spring and fall term. Participation is voluntary and there is no charge. Topics of courses offered during the 1985-86 school year included: classroom dioramas, sky observing, collecting and identifying fossils, environmental science, use of computers in secondary science, thinking skills in mathematics, teaching strategies for mathematics, and introduction to statistics and probability.

Professional Training Incentive Program (PTIP) 352

Joseph W. Proffitt, Instructional Services Director
Amity Regional School District No. 5
25 Newton Road
Woodbridge, Connecticut 06525

Target Population: K-12 Teachers

The PTIP program is designed to encourage staff members to participate in training courses or activities necessary to give them the skill(s) required to fulfill a perceived need of the school system. Ten thousand dollars is budgeted each year to compensate them for the expenses incurred for such training. Often the creation of a new course or the introduction of a new technology into the department requires the teacher to obtain knowledge or skills above his/her level of expertise. A good example may be the integration of computer technology into the process of teaching chemistry. This program motivates teachers to obtain such training, increases their confidence and expertise, and significantly improves the delivery of the district's curriculum to the students.

Project M.A.S.T.E.R. (Math and Science Teaching-Enhancement & Renewal) 353

J.K. Welling, Curriculum/Staff Development Director
Community Education Roundtable of St. Jospeh County
1700 Michawaka Avenue, Box 7111
South Bend, Indiana 46634

Target Population: Elementary Teachers

Project M.A.S.T.E.R. is designed to train K-3 teachers to teach science through language arts. A wide range of activities including "make and take" workshops, a teacher science fair, a conference on science and the language arts, seminars, field trips, and networking with fellow teachers and scientists from business and higher education provide participants with a year long series of hands-on inservice learning opportunities. As a result of these activities, elementary teachers themselves become less "science shy" and can through integrating science with the language arts curriculum impart a new understanding and enthusiasm about science to their students. The myriad of innovative activities gives teachers a chance to develop both new science teaching skills and an expanded ability to use community resources.

St. Vincent Honors Program **354**

Harrie E. Caldwell, Curriculum and Research Director
Westmoreland Intermediate Unit and St. Vincent College
222 East Pittsburgh Street
Greensburg, Pennsylvania 15601

Target Population: Science and Mathematics Teachers

This special training provided a research experience for participants. Eleven classroom teachers were matched with five project directors (college professors). During the summer of 1985, participants spent four intensive weeks investigating a topic consistent with their project director's research interest. Topics included: stellar photometry, electrochemistry of selenium, forest ecology during gypsy moth invasion, computer enhanced high school geometry, and developing robot control algorithms. In essence, participants identified a small related problem, planned an approach, collected data, and began an analysis of the data. The analyses culminated in symposium, written reports, and, hopefully, several articles. Generally, training for science and math teachers does not include experiences that approach what is done by scientists and mathematicians. Our program provides teachers with an opportunity to be a scientist or mathematician.

Saturday Morning Programs **355**

Virginia Ellett, Program Specialist
Mathematics and Science Center
2401 Hartman Street
Richmond, Virginia 23223

Target Population: Grades 2-4

Saturday Morning Searchers Program is for third and fourth graders who must be accompanied by a parent. There are three hour enrichment Saturday programs indoors during the winter and all day field trips in the fall and spring. Many hands-on activities, even during time spent on the bus. Program activities include: Calculator Capers--hands-on activities with the calculator which each child keeps; LOGO--one family per computer; Nature Experiences--trips to various state parks for nature walks and activities along the way; and Fossil Pit--collecting a great variety of fossils. The Saturday Morning Peepers Program is for second graders who also must be accompanied by a parent. There are three hour enrichment Saturday programs during the winter months followed by field trips in the spring. Field trips include a bird lesson with follow-up trip to the National Zoo in Washington, D.C., and a dinosaur lesson with a trip to the Smithsonian for a hands-on program.

Savings through Energy Management (STEM) 356

Carol A. Wilson, President
Wilson Educational Services, Inc.
60 Creamery Road
Cheshire, Connecticut 06410

Target Population: Grades 8-12
Secondary Teachers

The goals of STEM are to reduce energy consumption in schools and to develop math and science skills in students so they can be the prime movers in the effort. Students and teachers learn as a team, use their school building as a laboratory, and interact with their custodian, administration, and school board. Equipment used includes a light meter, burner test equipment, recording thermometer, rulers, and calculators. The program has existed since 1979. Teenagers assume a leadership role in their community. They work as a team to cope with the very real problem of high energy expense. Even potential drop out students become enthusiastic about using skills in a positive way.

School/Industry Cooperation in Mathematics and Science Education 357

Mahlon Wissink, Science/Mathematics/Technology Coordinator
Independent School District No. 535, Rochester Public Schools
Edison Administration Building
615 7th Street, S.W.
Rochester, Minnesota 55902

Target Population: Grades 7-8

In a unique cooperative project, Rochester IBM and the Rochester Public Schools have developed and implemented a program which is of great benefit to both organizations. Curriculum materials for 7th and 8th grade students (and many other areas) have been developed, teachers instructed in their use, and integrated into the curriculum in 7th and 8th grade as a part of their instruction in mathematics and science. Two Rochester teachers and two teachers from area schools are employed each year to work at the site as a part of a sabbatical leave program. While on leave, teachers teach colleagues, IBM personnel, and students about the use of the computer and design new curriculum materials. Students are bused to IBM to a laboratory assigned to the project.

Scientific Specialization for Exemplary Teachers 358

Madeleine J. Long, Director
Institute for the Advancement of Mathematics and Science Education
Long Island University
Brooklyn, New York 11201

Target Population: Elementary Teachers

This is a three-year NSF funded project to improve teaching of mathematics and science in the elementary school (grades 4-6); to train a core of exemplary teachers to serve as peer teacher trainers in their schools and districts; to stress content areas of mathematics, science, and computers in the first year with emphasis on integration of subject matter; and to devote the second year to curriculum development in mathematics, science, and peer teacher training. The Institute operates in close cooperation with school districts in the selection of teacher participants, the choice of mathematics and science curriculum projects to be completed, and to implement the peer teacher training program. A school district grant released time to teachers twice a week for a year. Supervisors and administrators from the district teach in the project.

Sci-Math 359

M. Goodstein, Project Director
Sci-Math/ACES
295 Mill Road
North Haven, Connecticut 06473

Target Population: Grades 7-12

Sci-Math teaches the mathematics needed for the introductory secondary sciences using the same problem-solving approaches needed in business, home, industry, and consumer purchasing. It focuses on the arithmetic and algebra of proportions to build understandings, and employs hands-on activities with ordinary materials already in the classroom. It may be used for average and gifted students in grades 7-9 as part of the mathematics or science course, and for low achievers in grades 9-12 at a much slower rate. Depending on how much of the curriculum is used, instruction requires from six weeks to one semester. Sci-Math has been in use for three years. Even though it has long been recognized that lack of mathematical skills is a major hindrance to the enjoyment and understanding of science, Sci-Math is, presently, the only course that directly teaches the understandings needed to apply mathematics to science.

Scope and Sequence **360**

Adolph P. Vay, Elementary Education/Curriculum K-8 Director
McKeesport Area School District
2225 Fifth Avenue
McKeesport, Pennsylvania 15132

Target Population: Grades K-12

A Scope and Sequence of Instructional Objectives has been developed by the staff in science (grades 1-12) and math (K-12). The Scope and Sequence specfically notes those objectives each grade level teacher is responsible for introducing, teaching to mastery, or reviewing. The material selection committees use the Scope and Sequence as a base for choosing texts and supplemental products.

Select Program in Science and Engineering (SPISE) **361**

Alfred Posamentier, Professor
The City College of New York of CUNY
138th Street & Convent Avenue, R 6/207
New York, New York 10031

Target Population: Grade 10

The purpose of SPISE is to movtivate and prepare disadvantaged high school students for careers in science and engineering. SPISE activities are specifically designed to encourage students to complete advanced high school mathematics courses which are a prerequisite for college level work in science and engineering. The program enrolls tenth grade students from 18 cooperating New York City high schols each year. One mathematics and one science teacher from each of the high schools assist in the program and share responsibility for follow-up. The program consists of mathematics enrichment sessions, laboratory activities in science and engineering, career guidance workshops, and lectures by professional scientists and engineers. The mathematics topics include sampling and statistics, logic and boolean algebra, graph theory, and scientific notation and calculator applications. The science and engineering laboratories focus on meteorology, radioactivity, size of molecules, strength of materials, logic gates used in computers, and energy conservation.

Special Curriculum Materials and Novel Assignments Combining Science and Math with Other Instructional Topics 362

Glen Randall Stavens, Program Implementor
Robert Fulton Middle School
2760 North First Street
Milwaukee, Wisconsin 53212-2499

Target Population: Grades 6-8

Robert Fulton Middle School is about to implement a math/science program as a specialty program within the regular middle school program. Since it has been important to involve language arts, reading, and social studies, many topics have centered around inventions, robots, and the future through the creative process of making discovery and invention possible. A broad range of discoveries and inventions are highlighted and innovation, dreaming, and inventing through cloning, human hibernation, and genetic engineering are encouraged--making the unimaginable imaginable.

Special Education Curriculum Math and Science 363

Marilyn Silverman, Principal
Roslyn Junior High School
Locust Lane
Roslyn Heights, New York 11577

Target Population: Grades 7-8 - Special Education Students

The special education program is designed to give our students a departmentalized approach to education similar to that of the mainstreamed population. Our curriculum has been developed to parallel the mainstreamed curriculum in math, science, social studies, and English. The seventh grade students explore two important areas of science: basic skills and life science. The students develop skills in experimentation, report writing, and equipment use, and complete laboratory experiments in using metric measurement, data tables and graphs, triple beam platform balance, bunsen burners, and microscopes. The eighth grade students explore the complex areas of the physical sciences. Topics on energy, force, work, aviation, electricity, magnetism, and chemistry are covered through classroom lessons and hands-on experiences. The special education math programs for both seventh and eighth graders include topics such as numeration, basic skill review, problem-solving, time, money, and measurement. Other major components of the math instruction are calculators and computers.

Special Inservice Training Efforts **364**

T.J. Alexander, Superintendent
McComb Municipal Separate School District
695 Minnesota Avenue
McComb, Minnesota 39648

Target Population: Science and Mathematics Teachers

The goals of this program are to enable staff members to improve teaching skills by providing training in needed areas; to provide productive and adequate time for conducting activities; and to provide a system of recording staff development activity credit. A model Staff Development Program was designed for the state with the financial assistance of the McComb Chamber of Commerce, Phil Hardin Foundation, and the McComb Board of Trustess. The organizational structure and school calendar year were changed to set aside Wednesday afternoons for activities by releasing students after lunch. Professional training was made available locally in the form of college credit courses and topics based on needs of staff. Opportunities were provided to staff members to gain three units toward recertification of teaching credential at no expense to them. An accurate computerized record of staff development was provided as well as a system of tracking staff development activities for each staff member.

Specialized High School for Science and Technology **365**

David E. Sawyer, Assistant Superintendent, MIS
Fairfax County Public Schools
Management Information Services
3701 Franconia Road
Alexandria, Virginia 22310

Target Population: Grades 9-12 - Selected Students

This specialized high school provides maximum integration and coordination of coursework in mathematics and science; accelerated and advanced courses in both mathematics and science, an emphasis on the humanities as part of the preparation of prospective scientists and engineers; and opportunities for individual study, research, and experimentation in a variety of technology-oriented environments. Time is scheduled for all students to participate in technology laboratory experiences to enhance and support required and elective coursework. The business/industry community were included in both the design and implementation of the programs and in the delivery of instruction. The school provides inservice experiences to teachers in the region as well as field trips and other orientation programs for younger students to encourage interest and achievement in science and mathematics.

Staff Development in Math and Science Cooperatively 366

Paul B. Clouse, Administrative Assistant
Arkansas Valley BOCES
9th and Santa Fe
La Junta, Colorado 81050

Target Population: Grades K-12

The districts in the area BOCES have agreed to pool their state allocations into a joint effort to inservice teachers and administrators in current practices and materials in math and science in the K-12 spectrum. A network design will be developed to further this process. Inservicing will include updated and current teaching techniques and learning patterns; the higher level thought processes including critical and creative thinking skills; hands-on units in math or science projects; and helping teachers to reach the historically underrepresented and underserved students.

Thinking Education Experience Camp 367

Carol Hill, K-12 Curriculum Director
Apache Junction School District
P.O. Box 879
Apache Junction, Arizona 85220

Target Population: Grade 6

This program involves the practical application of year-long science and math learning in a democratic decision-making environment including solving real life problems of group living. The goals include increasing the understanding, appreciation, and knowledge of nature and the out-of-doors, and the appreciation of classmates and teachers. The methods in science are the utilization of astronomy, model rockets, and year-long, hands-on experiments, and in math are environmental applications including estimating heights, distances, graphing, averaging, estimated travel time, and orienteering. Activities include construction of model rockets, environment, repelling (heights, distances, shadows), and constellation construction. The program utilizes community parents as camp staff having an extremely positive community relationship in support of the extra-cost curricular program. Classroom teachers serve as administrators, and parents as instructors.

Use of Videotapes and Computer Programming 368

George Libonate, Assistant Superintendent
Ridgewood Public Schools
49 Cottage Place
Ridgewood, New Jersey 07451

Target Population: Grades 4-6

This practice integrates science, math, and computer skills in regard to a program formulated by the Bank Street College of Education. Employing VCR tapes of thirteen episodes and science/math related expeditions, pupils follow a story plot of the sailing ship, Mimi, as the crew studies whale behavior. The year 1985-86 is to be used as a pilot operation to determine the value and grade level appropriateness of the program. This is the first program that attempts to provide direct science and math concepts into existing curricula models via a VCR/Computer software format. No formulated procedure for program assimilation is recommended, therefore, local options are permissible.

Valley of Virginia Science and Mathematics Consortium 369

William D. Smith, Co-Director
James Madison University
Education Department
Harrisonburg, Virginia 22807

Target Population: School Districts

The Valley of Virginia Science and Mathematics Consortium is an educational network which includes 22 small school divisions and a university. The network helps the school divisions define their science and mathematics educational needs, both traditional and innovative, and arrange for service to be provided to the school systems. The network has developed a relationship of confidence and cooperation between the school divisions and the university beyond anything they have ever had before. The network has assembled a prioritized list of educational services desired by the school divisions, a very valuable tool.

Young Scientists 370

Patricia K. Lowry, Assistant Professor
The University of Alabama
College of Education
P.O. Drawer R
University, Alabama 35486

Target Population: Grades K-3

The Young Scientists program, integrating specific science and mathematics concepts, has been organized for the past two years (four semesters). It is an innovative after-school program in which senior level early childhood education students work with children, ages 5-8 (grades K-3), in the content areas of science and mathematics. Large and small group instruction are incorporated into the program. The majority of the concepts are taught through the use of learning centers. Materials are gathered from any available source with a large portion being homemade.

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